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**ANNOTATED ACCOUNT OF FUNGI  
RECEIVED AT THE IMPERIAL  
BUREAU OF MYCOLOGY**

**LIST II**

**(Fascicle 1)**

**By  
E. W. MASON**

**THE IMPERIAL BUREAU OF MYCOLOGY  
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INTRODUCTION

THIS is the first fascicle of the second List of Fungi received at the Imperial Bureau of Mycology, and comprises some of the genera of Hyphomycetes. It has been long delayed. In the routine work of determination, especially in consulting the lists of fungi recorded on a host plant or from neighbouring localities, it has frequently been noted that the same, or exceedingly similar, fungi (especially among those included in the Fungi Imperfecti) are apt to be recorded not only under different specific and generic names but in different families and even orders. Two alternatives presented themselves: either to give a bare record of the first name found to which the fungus could be referred with reasonable certainty (as was done in List I), or to bring together all records of fungi which hardly appear specifically distinct and, in certain groups at any rate, make a real effort to determine to which genus they could be most properly referred. The latter course has been followed in this annotated account. When, as has happened in a number of cases, it has not been possible to decide on the correct generic name, the facts on which the decision must ultimately rest are given when they have been elucidated.

Many workers in different parts of the world have helped with information and the loan of specimens. Free use has been made of the facilities to inspect the collections at the Royal Botanic Gardens, Kew, and, among many others, special acknowledgements should be made to the Director of the Botanischer Garten und Museum, Berlin-Dahlem, who has freely loaned many type specimens from that herbarium.

E. W. M.

## ACROTHECIUM PREUSS (?)

**Acrothecium lunatum** Wakker in Wakker & Went, De Ziekten van het Suikerriet op Java, p. 196, 1898.

On maize; Juaso, Ashanti; R. H. Bunting (C. B. 163); 17/12/24: Aburi, Gold Coast; R. H. Bunting (C. B. 233); 28/5/25. Also an isolation from C. B. 155.

On rice glumes; Gold Coast; R. H. Bunting (C. B. 290); the spores of this scanty collection were all 4-septate.

Isolation from paddy soil; Burma; D. Rhind (no. 2); comm. August, 1927.

On sugar-cane; Assuanti, Gold Coast; R. H. Bunting (C. B. 394); 29/6/26.

Isolation from tea roots; Ceylon; W. Small (no. 18); comm. November, 1926.

Isolation from *Sorghum* sp. (Guinea corn); Kambia, Northern Province, Sierra Leone; F. C. Deighton (M. 176); 28/12/27.

Isolation from '*Sorghum vulgare*' (Yellow Milo); Morogoro Experiment Farm, Tanganyika; C. B. Wallace (no. 1231); 7/6/28.

These determinations are based on an isolation from maize, made by Mr. Bunting, which was forwarded to Mr. Mitra at Pusa. He determined it as *A. lunatum* as known on maize and on a number of cereal hosts about Pusa, India. The isolation had 3-septate spores which did not usually exceed  $23 \times 8.5 \mu$  in size. Material on maize received at the same time showed 3-septate spores whose maximum observed dimensions were  $32 \times 10 \mu$ . The further isolations cited have shown 3-septate spores of the same general dimensions as the culture sent to Pusa. Provisionally included also under this name is C. B. 290 on rice with 4-septate spores; 4-septate spores have also been observed on maize material; their maximum size is about  $40 \times 12 \mu$ . No 4-septate spores have been observed in any isolation, and it is believed that these belong to a distinct strain; whether this strain should be referred to the same specific name is left an open question.

In culture the spore is usually unequal-sided sub-pyriform, with a rounded obtuse apex; the third cell from the base is disproportionately the largest, and the spore tapers from this cell to the narrow base, which is marked with a small projecting apiculus. On the host the spore tends to be bent sharply at its largest cell, and the resulting spore shape has suggested a number of specific names. The spore shape is rather closely repeated in the ascospore of a number of species of *Leptosphaeria* (e. g. *L. sacchari*), but no genetic connexion has been proved.

The fresh isolations made from sorghum from Wallace 1231 and Deighton M. 176 both formed cylindrical stromata on clear maize meal agar in Petri dishes as the plates dried out; these stromata appeared to be negatively geotropic. The isolation from tea roots (Small 18) had formed similar stromata in the test-tube when it arrived from Ceylon and was at first determined as *Podosporiella* sp. In fresh isolations the spores usually appear to be borne at the tip of the conidiophore in

a single whorl, and occasionally a double whorl of spores may be observed; in the same Petri dish, however, the spores may also be observed spirally attached.

The Gold Coast collections have been described and figured by Mr. Bunting in *Dept. Agric. Gold Coast Bull.* 10, pp. 16 and 18 and pl. vi; his description has been partly used in this account.

For all the collections and isolations above cited the name *Acrothecium lunatum* is provisionally accepted, but further study will be necessary to decide (1) if all the forms should be referred to one specific name, and if so to which; and (2) the correct generic name. The following is an account of the names already proposed for the same or very similar fungi.

On sugar-cane in Java, Wakker described *Acrothecium lunatum* (loc. cit. 1898) with 3-septate spores measuring  $30 \times 10 \mu$ . This is about the maximum size of the conidia as usually observed on the host, and the name may accordingly be provisionally accepted. Fungi apparently belonging here had been twice previously noted on sugar-cane in Java. In 1892 van Breda de Haan described *Leptosphaeria sacchari*, to which he attributed ring spot disease of sugar-cane; he described a conidial stage (with conidia 2- or 3-septate and measuring  $25 \times 10 \mu$ ) which appears to belong to the *A. lunatum* group (see Rood Rot, *Meded. Proefstat. voor Suikerriet in West Java*, p. 27, 1892). In 1896 Krüger ascribed ring spot to a conidial fungus which he described and figured. He described the conidia as 3- or 4-septate (rarely 2-septate); but he gave no measurements. His figures clearly show that he was dealing with a member of the *A. lunatum* group (see *Ber. Versuchsstat. für Zuckerrohr*, Heft 2, p. 254, taf. ii, figs. 1 and 2, 1896).

On maize, Saccardo described *Helminthosporium curvulum* from the Philippines with conidia 3- (rarely 4-) septate and measuring 25 to  $35 \times 8$  to  $9 \mu$  (see *Nuovo Giorn. Bot. Ital.*, N.S., xxiii, p. 214, 1916). The species is represented in Herb. Kew., in Baker Fungi Malayana nos. 217 and 239. In the material examined 3-septate spores only were noted, and they matched very well the material on maize received from the Gold Coast. Bunting has figured spores of the material at Kew (loc. cit.), and Drechsler similar material in the Office of Pathological Collections, U.S.A. (see *Journ. Agric. Res.*, xxxi, 3, p. 710, 1925). Drechsler figured a proportion of 4-septate spores; he also pointed out that this species has been confused in literature with a species of *Helminthosporium* with many-septate spores. [The following year Saccardo again described *H. curvulum* with 3-septate spores measuring  $35$  to  $40 \times 9$  to  $12 \mu$ ; the host was *Bambusa blumeana* from the Philippines (see *Atti Accad. Sci. Veneto-Trentino-Istria*, x, p. 89, 1917). It is not clear whether or not he was intending to make a new species and used the same name again in error.] What were apparently similar isolations from maize were recorded in 1922. Stevens states that he received four isolations from corn (*Zea mays*) from G. N. Hoffer, Indiana, U.S.A., of a species of *Helminthosporium* whose conidia 'though perhaps not quite identical agreed closely with

each other. They were mostly 5-celled (i. e. 4-septate), with the central cell inequilateral and the two end cells pale. In conidial measurements they approached rather closely to *H. inaequale* Shear, *H. tritici* P. Henn., and *H. geniculatum* T. & E.' (see *Illinois Nat. Hist. Survey Bull.*, xiv, Article v, pp. 183-184, 1922). *H. inaequale* Shear, from the published accounts and figures, has spores which repeat the morphology of the species under discussion; *H. tritici* P. Henn., however, described on wheat from Tanganyika, is in no way related; examination of type material, ex Herb. Berlin, shows that no spores in any way similar to the present species are present. *H. geniculatum* Tracy & Earle was described on the spikelets of *Eragrostis rachitricha* from Mississippi, U.S.A., with spores usually 4-septate and measuring  $35$  to  $40 \times 8$  to  $10 \mu$  (see *Bull. Torrey Bot. Club*, xxiii, p. 207, 1896). No authentic material is available here. If this species really belongs to the *A. lunatum* group, as its description strongly suggests, it provides the earliest specific name noted for a fungus of this group described upon grasses, or at any rate for those strains with 4-septate spores.<sup>1</sup>

On wheat in Java, Palm has recorded *H. geniculatum* Tracy & Earle with spores 3-septate and measuring  $25$  to  $35 \times 10$  to  $15 \mu$  (see *Meded. Labor. Plantenziekten*, Java, No. 34, p. 14 and fig. 9, 1918). His figures show that he was dealing with a species similar to those under discussion, and Mitra (in litt.) has suggested that the species was actually *A. lunatum*. At Minnesota, U.S.A., Henry isolated, from seed and roots of wheat, four strains which he listed as *Helminthosporium* M. From his figures the spores are clearly of the same type as *A. lunatum*. In three of the strains the spores were 4-septate and in one strain they were 3-septate. Two of the strains formed cylindrical stromata in culture; two did not. The strains differed markedly in pathogenicity (see *Minnesota Agric. Exper. Stat. Bull.* 22, pp. 36-43, pl. xi, fig. 2 and pl. xii, figs. 3-5, 1924).

On sorghum (*Andropogon sorghum* Auct.) from the Philippines, Saccardo has described *Helminthosporium caryopsidum* with 3-septate spores measuring  $26$  to  $30 \times 8.5$  to  $9.5 \mu$  (see *Ann. Mycol.*, xii, p. 313, 1914). In 1916 he recorded the species again on sorghum from the Philippines with spores  $26$  to  $27 \times 9$  to  $12 \mu$ . He noted their resemblance to the spores of *H. curvulum* on maize, but considered that the two species were sensibly distinct. Baker's Fungi Malayana no. 238 in Herb. Kew. labelled *Helminthosporium caryopsidum* Sacc., shows spores of the characteristic shape and hardly appears to me to be specifically distinct from the material of *H. curvulum* on maize. As in the case of *H. curvulum*, it has been confused in literature with a species of *Helminthosporium* with many-septate spores (see *Phytopath.*, ix, p. 137, 1919). *Acrothecium*

<sup>1</sup> *Brachysporium eragrostidis* P. Henn., described on *Eragrostis chapellieri* from the Belgian Congo, with spores 3-septate and measuring  $15-23 \times 10-15 \mu$ , is not a synonym of the species under discussion. The spores are not typically unequal-sided, and the two central cells are surrounded by a tough shining exospore; they look distinctly different from the *Acrothecium* spores and do not show a projecting apiculus at the base. Type material ex Herb. Berlin examined.

*lunatum* has been recorded on sorghum in Ceylon by Petch (*Ann. Roy. Bot. Gard. Peradeniya*, ix, 3, p. 327, 1925).

On *Andropogon citratus*, *A. schoenanthus*, and other species of *Andropogon* in Java, Zimmermann has described *Napicladium andropogonis* with 3-septate spores measuring  $40 \times 20 \mu$  (see *Centralbl. für Bakt.*, Abt. II, Bd. VIII, p. 219, 1902). He has figured two spores of the characteristic '*A. lunatum* shape', whose breadth, however, is considerably less than half their width.

On *Pennisetum typhoideum* in India, Mitra has described *Acrothecium penniseti* with 2- or 3-septate spores, measuring  $30.4$  to  $41.8 \times 17.1$  to  $20 \mu$ . The species was erected after a cultural comparison with *A. lunatum* Wakker (see *Mem. Dept. Agric. India*, Bot. Ser., xi, 3, pp. 57-74, Jan. 1921).

On spikelets of *Setaria* sp., Porto Rico, Tehon has described *Acrothecium flacatum*.<sup>1</sup> He recognized its affinities with *A. lunatum* but separated it because the spores were mostly 4-septate and because it attacked another host (*Bot. Gaz.*, lxvii, p. 509, 1919).

Spores of a similar form and of the same general size and associated in culture with cylindrical stromatic bodies are described for the following species.

(1) *Helminthosporium inaequale* Shear; isolated from cranberry fruits (*Bull. Torrey Bot. Club*, xxxiv, p. 307, 1907).

(2) *Brachysporium trifolii* Kauffm. in *Phytopath.*, x, p. 441, 1920, emend. Bonar in *Amer. Journ. of Bot.*, xi, pp. 123-158, 1924, causing a leaf spot of clover: it was at first described as associated genetically with a *Blennoria* stage, but this statement was withdrawn in the second paper.

(3) *Brachycladium ramosum* Bainier in *Bull. Soc. Mycol. Fr.*, xxiv, p. 80 and pl. vi, 1908; isolated from nettle (*Urtica dioica*).

In addition there are records of fungi, described in culture, with spores of the same general size and shape but not obviously unequal-sided and without a disproportionately large third cell. These are:

(1) An isolation from soil in England, described by Miss Dale, with spores 2- or 3-septate and measuring  $25 \times 15 \mu$ ; in culture it developed cylindrical stromata; it was referred, apparently in error, to *Helminthosporium interseminatum* Berk. & Rav. (see *Ann. Mycol.*, x, p. 469, 1912).

(2) An isolation from soil in Louisiana, U.S.A., referred by Gilman and Abbott to *Spondylocladium xyloigenum* A. L. Smith. The spores are described as 3-septate and measuring  $15$  to  $25 \times 8$  to  $13.5 \mu$  and slightly bent (see *Iowa State Coll. Journ. of Sci.*, i, 3, p. 322, fig. 70, 1927).

(3) *Spondylocladium maculans* Bancroft isolated from spotted crepe rubber in Federated Malay States. The spores were described as 3-septate and measuring  $23$  to  $25 \times 11$  to  $14 \mu$  (see *F. M. S. Dept. Agric. Bull.*, 16, p. 17 and pl. II, figs. 3 to 6, 1913).

<sup>1</sup> Is this a misprint for *falcatum*, referring to the bent spores?

## Summary.

There are a number of records on grasses of fungi with a highly characteristic spore structure. The spores of the species observed are 3- or 4-septate and increase in size from the base to the third cell, which cell is always disproportionately large. The spores are accordingly broadest towards their obtuse apices and are always swollen out on one side; on the host a high proportion of spores are also bent at the largest cell, and the apical and basal cells tend to remain hyaline. In culture the spores tend to be borne in a terminal whorl and occasionally two whorls may be seen on the same conidiophore, but the spores may also be borne spirally on the conidiophore. Under certain conditions of culture these fungi tend to produce cylindrical stromata. Following Mr. Mitra of Pusa, the name *Acrothecium lunatum* Wakker is provisionally accepted as providing the earliest specific name, at any rate for those strains with 3-septate conidia whose breadth does not exceed  $12\mu$ . Other records of such fungi with 3-septate spores on grasses are *Helminthosporium caryopsidum* Sacc. on sorghum and *H. curvulum* Sacc. on maize, both from the Philippines, which from material in Herb. Kew. hardly appear to be specifically distinct; Palm's determination of *H. geniculatum* on wheat in Java; and one isolation of *Helminthosporium* M. from wheat by Henry at Minnesota, U.S.A. *Napicladium andropogonis* Zimmerm. described on *Andropogon* spp. in Java might well be the same species from the two spores figured, but judging from the spore measurements given is perhaps distinct.

Records of similar fungi with 4-septate spores are *Helminthosporium geniculatum* Tracy & Earle on *Eragrostis rachitricha*, Mississippi, U.S.A. (probably); *A. flacatum* Tehon on *Setaria* sp., Porto Rico; three strains of *Helminthosporium* M. isolated by Henry from wheat; and four strains (unnamed) isolated by Hoffer from maize, Indiana, U.S.A.

There does not appear to be any evidence that in culture the 3-septate and 4-septate spore forms pass into one another; but whether it is wise to distinguish them specifically appears to be doubtful. If it should appear that the strains with 4-septate conidia should not be considered specifically distinct, it is probable that the earliest specific name for such fungi on grasses will be provided by the name *Helminthosporium geniculatum* Tracy & Earle.

*A. penniseti* Mitra is described with 2 or 3 septa and considerably broader spores than those mentioned above, except *Napicladium andropogonis* Zimmerm.; it was founded by its author after a cultural comparison with *A. lunatum* and must accordingly be accepted as a good species.

Fungi not recorded from grasses but resembling *A. lunatum* in spore shape and producing cylindrical stromata in culture, are *Helminthosporium inaequale* Shear, *Brachysporium trifolii* Kauffm., emend. Bonar, and *Brachycladium ramosum* Bain.; it is believed that these species will prove to be strictly congeneric with *A. lunatum*.

SUMMARY OF SPECIES MENTIONED IN THE DISCUSSION OF *A. LUNATUM*.

|                                     |                       | Host.                         | Septation.                              | Diagnosis of spore, | Measurements.                     |
|-------------------------------------|-----------------------|-------------------------------|-----------------------------------------|---------------------|-----------------------------------|
| <i>Helminthosporium geniculatum</i> | Tracy & Earle         | <i>Eragrostis rachisticha</i> | 4 (usually)                             |                     | 35 to 40 × 8 to 10 $\mu$ .        |
| "                                   | "                     | <i>Triticum</i>               | 3                                       |                     | 25 to 35 × 10 to 15 $\mu$ .       |
| <i>Acrothecium lunatum</i>          | Wakker                | <i>Saccharum officinale</i>   | 3                                       |                     | 30 × 10 $\mu$ .                   |
| <i>Napicladium andropogonis</i>     | Zimmerm.              | <i>Andropogon</i> spp.        | 3                                       |                     | 40 × 20 $\mu$ .                   |
| <i>Helminthosporium inadequale</i>  | Shear                 | <i>Vaccinium</i> fruit        | 3 to 5                                  |                     | 22 to 32 × 11 to 14 $\mu$ .       |
| <i>Brachygladium ramosum</i>        | Bainier               | <i>Urtica dioica</i>          | 3 (sometimes 4)<br>[Taken from figures] |                     | 25 to 31 × 11 to 14 $\mu$ .       |
| <i>Helminthosporium caryopsidum</i> | Sacc.                 | <i>Sorghum vulgare</i>        | 3                                       |                     | 26 to 30 × 8.5 to 9.5 $\mu$ .     |
| "                                   | "                     | "                             | —                                       |                     | 26 to 27 × 9 to 12 $\mu$ .        |
| "                                   | <i>curvatum</i> Sacc. | <i>Zea mays</i>               | 3 (rarely 4)                            |                     | 25 to 35 × 8 to 9 $\mu$ .         |
| "                                   | "                     | <i>Bambusa blumeana</i>       | 3                                       |                     | 35 to 40 × 9 to 12 $\mu$ .        |
| <i>Acrothecium flacdatum</i>        | Tebon                 | <i>Setaria</i> sp.            | 3 or 4                                  |                     | 35 × 10 $\mu$ .                   |
| <i>Brachysporium trifolii</i>       | Kaufm.                | <i>Trifolium repens</i>       | 3 (usually)                             |                     | 21 to 31 × 9 to 11 $\mu$ .        |
| <i>Acrothecium penniseti</i>        | Mitra                 | <i>Pennisetum typhoidum</i>   | 2 to 3                                  |                     | 30.4 to 41.8 × 17.1 to 20 $\mu$ . |

## The correct generic name.

It will probably be agreed that the fungi mentioned in the table should, at any rate, all be included in the same genus, whether their conidia are usually attached in spirals or more or less in whorls (which are in fact, in these genera, only close spirals).

An attempt to find an undoubted member of the *A. lunatum* group which is, at the same time, itself the type species of a genus, has not been successful. Nevertheless, the description and figure of *Acrotheciella javanica* Koorders,<sup>1</sup> the only species of that genus, is very suggestive, and it may well be that if that species can be found again and brought into culture it may provide the genus which is so badly needed. The fungus twice developed on portions of *Ficus elastica* in a damp chamber in Java. It formed wart-like stromata, which in turn bore numerous long conidiophores; these in turn bore acrogenous and pleurogenous conidia. The conidia are described as oblong, curved, 2-septate (rarely 3-septate), with the large middle cell more olivaceous than the two end cells; their measurements are given as 20 to 22  $\times$  10 to 10.5  $\mu$ . When one remembers the readiness with which some members of the *A. lunatum* group form cylindrical stromata in culture, the occurrence of the genus *Acrotheciella* in the Tuberculariaceae, where it was placed by Koorders, presents no difficulty. The spores, however, are drawn as rather thick-walled and without the rather characteristic projecting apiculus at the base. Until this fungus is recognized again and brought into culture it would appear premature to adopt the genus *Acrotheciella* for members of the *A. lunatum* group.

A number of workers have referred these forms to the genus *Helminthosporium*. It is true that practically any of the Dematiaceae-Phragmosporae could be placed in this overloaded and heterogeneous genus, but as the real affinities of the different forms gradually become clear they will almost certainly be separated out again into different genera. For instance, it does not seem probable that the straight oblong cylindrical forms such as *H. teres*, with permanent septa and lateral germination, and which are connected genetically with *Pyrenophora*, will permanently remain in the same genus with curved tapering forms such as *H. oryzae* and *H. maydis*, with diffluent septa and polar germination, and which are genetically connected with the so-called *Ophiobolus* species. Members of the *A. lunatum* group are readily recognized in their spore form alone from the great majority of species now included in *Helminthosporium*; they are not identical with the type species of that genus, *H. velutinum* Link (so far as that species is known at all), and none of the numerous species compiled in *Sylloge*, iv, in the genus *Helminthosporium* appear to be referable to the *A. lunatum* group, with the possible exception of *H. cesatianum* Mont., of which no authentic material is here available. The broad obtuse apices of the spores of *A. lunatum*, correlated with the fact that the greatest width of the spore is

<sup>1</sup> *Untersuchungen*, p. 250, and Abb. 61, 1907.

in the apical half, indicates affinity with the original species of *Brachysporium* and the mass of the species compiled in *Acrothecium* rather than with the mass of the species of *Helminthosporium*. Finally, as at least three other good species of *Helminthosporium* have been received from the Gold Coast on maize alone, it is very convenient to have another generic name to which to refer *A. lunatum*.

With regard to the genus *Brachysporium*, rather an interesting point arises. As Bunting has pointed out, in spores of fungi of the *A. lunatum* group, whether they are 3- or 4-septate, the third cell from the base is always disproportionately the largest. Now *Brachysporium* was separated by Saccardo for species with similar spores to *Helminthosporium* but shorter and ovoid or pyriform in shape. He gave two species as examples, *H. obovatum* Berk. and *H. cornuicoides* de Not. (see *Michelia*, ii, p. 28, 1880). In the first species, *Brachysporium obovatum* (Berk.) Sacc., the spore is 2-septate with a disproportionately large third (or apical) cell, and it is attractive to think that this spore represents a simpler stage of the same line of evolution as that represented by the spore of the *A. lunatum* group. *Helminthosporium obovatum* is described as having a single spore borne terminally on its conidiophore, and both these structures are highly chitinized. When this fungus is, however, recognized again in the field and brought into culture it may well appear that members of the *A. lunatum* group should be considered closely related to, even if not congeneric with, *B. obovatum*, which may be considered the type species of the genus *Brachysporium*.

A fungus with spores similarly shaped to those of *B. obovatum* is compiled in *Sylloge*, iv, p. 484, in the genus *Acrothecium*, viz. *A. obovatum* Cke. The spores are described as borne 3 to 5 at the tip of the conidiophore; they are obovate, 2-septate, with a large terminal cell.<sup>1</sup> But the question arises whether the genus *Acrothecium* as used by Saccardo can stand.

The name *Acrothecium* was first used by Corda as a sub-genus of *Trichothecium* for the species *Trichothecium (Acrothecium) parasitans* Corda, which that author found growing on a synnema of *Stysanus* (see *Icones Fungorum*, ii, p. 10 and taf. ix, f. 49, 1838). This species has not apparently been recognized again; it is compiled in the *Sylloge* as *Blastotrichum parasitans* (Corda) Sacc. *Acrothecium* was first used as a generic name by Preuss in 1851, in his *Fungi of Hoyerswerda* no. 36, for the single species *A. multisporum* Preuss, growing on the cork of a wine-bottle (see *Linnaea*, xxiv, p. 111, 1851). This species was later figured by Preuss in Sturm's *Deutschl. Flora*, Abt. III. Bändch. vi, Heft 30, t. 43, 1851. The spores form a clump at the tip of the dark-coloured conidiophore, they are narrow elliptical, are finally 1-, 2-, or 3-septate, and remain sub-hyaline. This fungus has apparently not been recognized again. In the same volume of Sturm Preuss erected the new genus *Cucumisporium* on the single species *C. tenebrosus* Preuss:

<sup>1</sup> Examination of material in Herb. Kew, shows that the measurements given in the *Sylloge* are too large; the maximum length of the spore is about 12  $\mu$ .

the spores are finally brown and 3-septate and are again borne more or less in a whorl at the tip of the conidiophore. The fungus grew on wood and bark of birch, and has been recognized in similar habitats in Italy and also in Austria. In *Michelia*, ii, p. 29, 1882, Saccardo used the genus *Acrothecium*, which he attributed to Corda and proposed as examples of the genus *A. bulbosum* Sacc., and *Cacumisporium tenebrosium* Preuss, which latter species he had already referred to *Acrothecium*. In *Sylloge*, iv, p. 433, 1886, he again treated *Acrothecium*, which he here attributed to Preuss in Fungi of Hoyerswerda no. 99. Now, as stated above, *Acrothecium* Preuss is Fungi of Hoyerswerda no. 36 and contains only one species *A. multisporum* Preuss. This species, however, Saccardo excluded from the genus *Acrothecium* and referred to the genus *Acrotheca* Fuckel. Fungi of Hoyerswerda no. 99, cited by Saccardo as *Acrothecium*, is the genus *Cordana* Preuss, which Preuss here founded with three species. Of these Saccardo refers *C. polyseptata* and *C. pedunculata*, the first and third species respectively, to *Acrothecium*; *C. pauciseptata*, the second species, he at first referred to *Acrothecium*, but later (*Sylloge*, iv, p. 376) he placed it again in its original genus *Cordana* as the only remaining species; he restricted the genus to include only species with 1-septate spores and placed it in the Dematiaceae-Didymosporae.

Now at first sight it may be argued that the name *Acrothecium* as used by Saccardo must be rejected, as it is now considered an untenable position to adopt an author's generic name and definitely to exclude from the genus the founder's type and only species. However, it may be argued that, taking Saccardo's genus *Acrothecium* on his diagnosis, he wrongly excluded the type species *A. multisporum* from it. Saccardo placed this species in the genus *Acrotheca* Fckl., which is in the Dematiaceae-Amerosporae and is characterized by its 1-celled spores. But Preuss (loc. cit.) has distinctly figured the spores as faintly septate, so that *Acrothecium multisporum* seems to be correctly placed in *Acrothecium* as the genus defined by Saccardo himself.

For this reason it appears that the genus *Acrothecium*, as now used, may perhaps stand, although one may well wish to know if species with spores permanently sub-hyaline are really congeneric with species usually referred to *Acrothecium*; in general the species referred to this genus have spores which do not have their greatest width in their basal half, and for this reason alone it appears to me a more suitable genus for members of the *A. lunatum* group than *Helminthosporium*, but, with the possible exception of *A. obovatum*, the spores of the earlier species do not bear any suggestive resemblance to the spores of *A. lunatum*.

The genus *Spondylocladium* is placed by Saccardo in the same group as *Acrothecium*, and is said to have its conidia in several whorls, instead of in a terminal whorl as in *Acrothecium*. As stated above, too much stress cannot be laid on this character, as in *A. lunatum* some conidiophores bear two whorls of spores. The type species of *Spondylocladium* is *S. fumosum* Mart. 1817. The species has been recognized and figured both by Preuss and also by Berkeley and Broome; in both cases the

spores are drawn as ellipsoid and 2-septate. If we accept the figures as representing a fungus such as Martius had in mind, it seems that *A. lunatum* might be classed in *Spondyliastrum*, differing from the original species only in its unequal-sided spores and in their unequal-sized cells. *S. xylogenum* A. L. Smith and *S. maculans* Bancroft are also closely related to *S. fumosum*.<sup>1</sup>

#### Summary of discussion on relevant generic names.

Taking the spore as the diagnostic character for the genus, *Acrothecium* Koorders is the only genus whose spore shows the disproportionate difference in the cell size associated with marked curvature. If this type species can be recovered, it seems probable that this genus might be safely adopted for species of the *Acrothecium lunatum* group. Spores of original species of *Brachysporium* share the character of disproportionate cell size, but have no marked curvature; and these species are not yet well understood. With reference to *Acrothecium*, further work requires to be done on the type and other species to make sure that this name can be used with its customary significance. The characteristic spore of *A. lunatum* is not reproduced in the type or other early species of the genus. *Spondyliastrum* is related in its type and certain other species, but again does not exactly reproduce the spore characters of *A. lunatum*. Finally it is considered convenient to keep *A. lunatum* separate from the very heterogeneous genus *Helminthosporium*.

#### ALTERNARIA NEES AND MACROSPORIUM FRIES

In the group of the Dematiaceae-Dictyosporae above all others it is desirable that some agreement should be reached as to the type or standard species on which certain genera should be based. Since the appearance of Bolle's paper on the Phaeodictyae in 1924, the indexing of the *Review of Applied Mycology* has followed her nomenclature in the species which she studied. In the hope that some general agreement may be reached, an attempt is here made, in an extremely general way, to recover the mycological tradition which went to mould that classification of these genera which appears in Saccardo's *Sylloge*, vol. iv.

In *Sylloge*, iv, Saccardo cites 81 nominal species of *Macrosporium* and six nominal species of *Alternaria*; since that time there have been heavy additions to the number of nominal species in each genus. It now appears that the mass of the species included under *Macrosporium*, including two of the original species of Fries, are species which do not differ from *Alternaria* but whose structure has been misinterpreted.

<sup>1</sup> With reference to *S. fumosum* Mart., it must be noted that Fries, in *Syst. Mycol.*, iii, p. 391, expresses the opinion that this species is a synonym of *S. xylogenum*. Some mycologists interpret the rules of nomenclature as holding that opinions expressed by Fries in this work are binding on later workers.

The spore shape of species of *Macrosporium* of the type  
*M. sarcinula* Berk.

As Elliott first pointed out (in *Amer. Journ. of Bot.*, iv, pp. 439-476, 1917), there is included with the mass of *Macrosporium* species a small group which differs completely in spore structure from the remainder. Of this group mention may be made of *M. sarcinula* Berkeley (as now interpreted), *M. parasiticum* Thüm., *M. rosarium* Penzig, and *M. commune* as figured by Penzig, Berlese, and Brefeld. Another well-known species of this group, compiled in *Sylloge*, x, is *M. sarcinaeforme* Cavara. This conidial form, to which, following Bolle, the genus *Macrosporium* is here restricted, is characterized by its oval to oblong spores with broad obtuse ends; the breadth of the apex and base of the spore not being significantly different. If the development is watched, the first septum is a cross-septum and is laid down at, or nearly at, the middle of the spore. The remaining septa are usually laid down without reference to the long axis of the spore. The spores are constantly and more noticeably echinulate than are the spores of *Alternaria* and, so far as is known, are never formed in chains. The oblong shape of the spore reminded Berkeley of packets of jute put up as merchandise, and he named the first species in which he observed them *M. sarcinula* [*sarcinula* = a little pack]. It will be convenient to refer to spores of this shape as 'sarcinula' spores.

The spore shape of species described under *Macrosporium* which  
belong equally to *Alternaria*.

Species of *Alternaria* are always considered (and correctly considered) as bearing, under suitable conditions, their conidia in chains. In examining the fungus on the host under herbarium conditions, however, the chains of spores are seldom, if ever, seen. It is a fact that these chains of conidia were not observed in the classical species described in the genus *Macrosporium*.

The range of spore shape is the same, however, whether the fungus is observed living or dead. The spores are always narrowly to broadly ovate, i.e. they are always broadest near to the obtuse base of the spore, and taper towards the more or less acute apex. The spore may or may not be produced into an apical beak; if it is, the spore form may be described as obclavate.<sup>1</sup> In all cases a number of cross-septa are laid down simultaneously across the spore body (not one cross-septum first as in 'sarcinula' spores); and later longitudinal septa are also formed.

From the accounts of many cultures of these fungi, species of *Alternaria* may easily be separated into two groups. (1) Species which have short beaks, seldom more than half the length of the spore and which in culture form conidia in long chains (sometimes up to 20 spores in a

<sup>1</sup> The term 'obclavate' (meaning an inverted Indian club) could be used in botanical literature to describe *Alternaria* spores either with or without their beaks; to secure uniformity in translation the term has been consistently used here as though it included the beak.

chain or even more). This may be called the *A. tenuis* group. (2) Species which can form long beaks up to several times the length of the spore, and which in culture form chains of two spores, or very occasionally three spores. This may be called the *A. solani* group.

The original species of *Macrosporium* Fr.

*Macrosporium* Fr. in *Syst. Mycol.*, iii, p. 373, 1832, was founded on four species. The first and third species, *M. convallariae* and *M. cheiranthi*, as generally accepted, are species of *Alternaria* Nees, as that genus is now universally understood. They were compiled by Saccardo in *Macrosporium*. The second and fourth species, *M. tenuissimum* and *M. caricinum*, as generally accepted, are characterized by the extreme shortness (or absence) of conidiophores and by the fact that the conidia only have cross-septa (i.e. have no longitudinal septa). These were compiled by Saccardo in the genus *Clasterosporium* Schw., of which *M. caricinum* is in fact the type species. No *Macrosporium* with 'sarcinula' spores was included by Fries in his original genus. Bolle is of opinion, however, that the conception of *Macrosporium* as having 'sarcinula' spores has become so strongly planted in mycological literature that the genus should now be treated as if it were founded on *M. sarcinula* (but with an amended diagnosis).

The conidial stages of *Pleospora herbarum*, &c.

Before giving an account of the *Alternaria* species which have received names in *Macrosporium* it will be convenient to note an added confusion. In the days before pure cultures of fungi were known it was thought that *M. sarcinula* and *A. tenuis* (sensu lato) might both be conidial stages of *Pleospora herbarum*. [(1) They may often be found growing together on the host; (2) Berkeley described spores of both kinds in his original account of *M. sarcinula*; and (3) Tulasne figured 'sarcinula' spores and chains of *Alternaria* spores attached to the same mycelium in his account of the conidial stages of *Pleospora herbarum*.] The effect of this has been that descriptions of fungi have been admitted, and are still copied in literature, which describe both spore forms as belonging to the same fungus. Gibelli and Griffoni, however, in 1872, seriously contested this and came to the conclusion that there were two distinct species of *Pleospora*:

(1) *P. sarcinulae*, with *M. sarcinula* as its conidial stage.

(2) *P. alternariae*, with an *Alternaria* as its conidial stage.

*P. sarcinulae* Gib. & Grif. is now nearly always called *P. herbarum* and is characterized by its ascospores with 7 cross-septa. There is an overwhelming weight of cultural evidence, with isolations started both from conidia and from ascospores, that *Macrosporium* spp. of the *M. sarcinula* type are genetically related to a *Pleospora* which has ascospores with 7 cross-septa.

*P. alternariae* Gib. & Grif. is now usually referred to *P. infectoria*

Fekl., and is characterized by having ascospores with 5 cross-septa. So far as I can find out, no one has ever got *Pleospora* perithecia in pure culture starting from *Alternaria* conidia, but starting from *Pleospora* ascospores (with 5 cross-septa) Brefeld twice obtained fungi which may be referred to the *Alternaria tenuis* group. He referred the species of *Pleospora* with which he worked to *P. vulgaris*<sup>1</sup> Niessl. and *P. infectoria* Fekl. respectively (see *Untersuchungen*, x, p. 225, 1891). Klebahn also, starting from ascospores with at first 3, but finally usually 5 cross-septa, got chains of *Alternaria* conidia of the *A. tenuis* group. He referred his perithecial form to *P. alternariae* Gib. & Griff. The fungus was collected on iris leaves (see *Ber. Deutsch. Bot. Gesellsch.*, xlii, pp. [67-69], 1924).

Historical outline of determinations of *Alternaria tenuis* group.

The genus *Alternaria* was founded by Nees on *A. tenuis* in 1817. He placed the genus between *Monilia* and *Torula*.

Fries in his *Systema Mycologicum*, iii, p. 500, 1832, did not accept the genus *Alternaria*, but referred *A. tenuis* to the genus *Torula*, where he renamed it *Torula alternata* Fr.<sup>2</sup> As mentioned above, on p. 373 of the same volume he founded the genus *Macrosporium*, with *M. conwallariae* as the first species and *M. cheiranthi* as the third species. Assuming that later workers have determined these two fungi correctly, they are species of *Alternaria*, i. e. congeneric with *A. tenuis* Nees.

In 1839 Corda described and figured *A. tenuis* correctly and stated that *Torula* Fr., *Syst. Mycol.*, iii, p. 500, and *Macrosporium* Fr., p. 373, were synonyms of *Alternaria* Nees. After this the genus *Alternaria* appears very little in systematic literature for about thirty years.

In 1836 Berkeley recorded *M. cheiranthi* Fr. on stocks and wall-flowers; Apethorpe, King's Cliffe [England]. This was his first determination of a species of *Macrosporium*, and it coloured his determinations all his life. It is not quite certain that this particular collection is now in the Berkeley's Herbarium at Kew; if it is, the specimen is labelled '*Macrosporium cheiri*, Kingscliffe' and is undated. It may be stated with certainty that this collection consists mainly of a member of the *A. tenuis* group, which for the purpose of this outline may be named *A. tenuis*.

Berkeley, as his Herbarium shows, not long after this adopted the name *M. cheiranthi* for species of *Alternaria* whose spores did not obviously differ in shape from those of *A. tenuis*, and consistently so used it all his life. In his *Outlines of British Fungology*, p. 345, 1860, he gives as the host range of the species, 'damp paper and decaying

<sup>1</sup> It is unfortunate that Brefeld's figure of the conidial chains of *Alternaria* spores which he obtained from germinating the ascospores of *Pleospora vulgaris* has been recently reproduced in error as the conidial form he obtained from *P. herbarum*; see Gäumann, *Vergleichende Morphologie*, p. 217. The error has been repeated on p. 220 of the American translation and revision of this book by Dodge under the title *Comparative Morphology of Fungi*.

<sup>2</sup> According to the rules of nomenclature, as they stand at present, the specific name of *A. tenuis* should now be '*alternata*'.

plants, &c.' In his 'Notices of North American Fungi' in *Grevillea*, iii, p. 105, 1875, he determined *M. cheiranthi* on about thirteen different host plants.

Cooke started work with this conception of *M. cheiranthi*. His *Fungi Britannici Exsiccati*, Edition 1, No. 197, published not long before 1870, is labelled *M. cheiranthi* Fr. on *Beta vulgaris* Neatishead, Sept. 1864.

What was apparently the remainder of Cooke's collection of this species, not used in this issue, was sent to Rabenhorst for use in his *Fungi Europaei*. Rabenhorst (aiming still at *A. tenuis*), presumably to indicate its universal occurrence on all hosts, decided to alter its specific name, and in 1870 issued his *F.E.* no. 1360, labelled as follows: '*Macrosporium commune* Rabenh. Herb. et Mspt., Type *M. cheiranthi* Fr. Neatishead, Norfolk, ad folia *Betae* vulg. leg. M. C. Cooke.' No diagnosis accompanied the exsiccatum. Cooke, in his *Handbook of British Fungi*, vol. ii, p. 576, 1871, lists his Neatishead collection as *M. cheiranthi* Fr.  $\beta$ . *Betae* Cooke, and cites both Cooke, *F.B.E.* no. 197, and *M. commune* Rabenh., *F.E.* no. 1360, as this form.

By 1876, when he issued his second edition of *Fungi Britannici Exsiccati*, Cooke had adopted Rabenhorst's name; no. 641 of this edition is issued as '*Macrosporium commune* Rabh. on Herb. Stems' without further comment. After this date he made a number of determinations of *M. commune* (all of which aimed at the *A. tenuis* group). Cooke, and following him Ellis, later described a considerable number of species of *Macrosporium* and *Mystrosporium*, which would now be reckoned as species of *Alternaria*; in particular his *M. fasciculatum* was picked out by Jones and Grout as a universally occurring species of saprophytic *Alternaria*, and Bolle in 1924 stated that *A. fasciculata* of Jones and Grout was in fact *A. tenuis*.

To revert to the history of *M. commune* Rabenh., which was issued without a diagnosis.

In 1874 Saccardo issued the first three centuries of his Venetian collections as 'Mycotheca Veneta'. No. 297 is labelled '*Alternaria tenuis* Nees [synon.] *Macrosporium commune* Rabh. Sacc. *Mycol. Ven.*, pp. 102 & 182 . . .'. The reference is to his 'Mycologiae venetae specimen', published 1873. This consists of a list of his collections with a few explanatory comments. On p. 182 he lists *M. commune* Rabenh. and next *M. sarcinula* Berk., and adds a note that these two species are both probably macroconidial stages of *P. herbarum*. This statement is merely a reference to Tulasne's idea that *M. sarcinula* and an *Alternaria* might both be the stages of *P. herbarum* and an indication that Saccardo was inclined to agree with it.

In 1882 Penzig published a description of *M. commune* (*Michelia*, ii, p. 478), and his illustration of the fungus was published in Saccardo's *Fungi Italici*, no. 1207. From his figure it may be definitely stated that he drew the wrong fungus; he did in fact figure a species with 'sarcinula' spores. These 'sarcinula' spores, which do not belong to

Rabenhorst's fungus, were accepted by Berlese and Brefeld as being the true *M. commune* Rabenh. Penzig's description, I think, was intended to refer to the fungus which he figured, but is in rather general terms; in particular, the spore shape is given as 'Conidiis forma et magnitudine variis'. Saccardo, when he compiled his *Sylloge*, iv, listed *M. commune* Rabenh. and *A. tenuis* separately. He improved Penzig's description of *M. commune*, however, so as to cover the shape both of the 'sarcinula' spores figured by Penzig and of the *Alternaria* spores of his own determination in *Mycotheca Veneta*, 297. He now apparently felt confirmed in his opinion that *M. commune* and *M. sarcinula* belonged to the same life-cycle.

Lindau, in Rabenhorst's *Kryptogamen-Flora*, ix, p. 226, has accepted Saccardo's description and somewhat increased the range of the spore measurements. That this description originally aimed at describing a mixture of *A. tenuis* (sensu lato) and of *M. commune* (sensu Penzig) becomes clear when we consider the diagnoses which have accompanied some determinations of the species of *Macrosporium*.

#### Historical outline of diagnoses which have accompanied determinations of *Alternaria tenuis* group.

Nees in 1817 founded the genus *Alternaria* on the single species *A. tenuis*; he described the chains of spores as hyphae with oval articulations (Glieder) separated by filiform interspaces. He figured the spores, however, as somewhat ovate. Fries, in 1832, under the name of *Torula alternata*, described the spores as oblong and drawn out at each end into a filiform apiculus. Corda, in 1839, described the spore-chains as we recognize them now; he said that the spores were inflated at the base and drawn out into an apical hyaline beak.

In 1832 Fries described the spores of *M. convallariae* as obovate with a short hyaline pedicel and the spores of *M. cheiranthi* as pyriform-clavate with a short pedicel.

In 1836 Berkeley recorded *M. cheiranthi* for England and gave a fairly full account of his observations of the spore shape. As mentioned above, he was dealing with a member of the *A. tenuis* group, but had not observed the catenulation of the spores, and considered obclavate spores with an apical beak to be clavate spores with a basal pedicel. It will be convenient now to take Berkeley's description line by line and invert it to represent the facts as they are now universally interpreted.

- |                                                                   |                                                                       |
|-------------------------------------------------------------------|-----------------------------------------------------------------------|
| 1. The sporidia vary extremely in form;                           | 1. The spores vary extremely in form;                                 |
| 2. some are clavate with a single row of articulations;           | 2. some are ovate with a beak, and have cross-septa only;             |
| 3. in others the two or three upper cells have a vertical septum; | 3. in others the two or three basal cells have a longitudinal septum; |

- |                                                                       |                                                                                         |
|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 4. others are broadly clavate ;                                       | 4. others are broadly ovate with a beak ;                                               |
| 5. and others again obovate ;                                         | 5. and others again ovate without a beak ;                                              |
| 6. each articulation divided by vertical partitions into many cells ; | 6. each primary cell of the spore being divided by longitudinal septa into many cells ; |
| 7. all are more or less constricted ;                                 | 7. all the cells are more or less constricted at the septa ;                            |
| 8. the peduncles vary in length.                                      | 8. the beaks vary in length.                                                            |

In 1838 Berkeley described and figured *M. sarcinula* : as Bolle has been the first to show, he describes and figures two quite distinct species : (1) consists of beaked *Alternaria*-like spores which he describes as clavate filaments whose apices gradually become incrassated [i. e. broader] : and (2), which bears the 'sarcinula' spores and has distinct differentiated conidiophores. Berkeley considered that (1) was a developmental stage of (2), but the whole weight of cultural experience is against this view. Bolle proposes to exclude from the diagnosis the *Alternaria*-like element and founds *M. sarcinula* anew on the 'sarcinula' spores and the differentiated conidiophore, and bases the genus *Macrosporium* emend. Bolle on this revised diagnosis.

Shortly after this Berkeley adopted the name *M. cheiranthi* for *Alternaria* species whose spores are not strikingly different from those of *A. tenuis*, and he adopted this determination of *M. cheiranthi* as the type species of the genus *Macrosporium* Fr. (see *Decades of Fungi*, no. 91, 1855).

From this time a very large number of species have been described, and are still being described in *Macrosporium* and related genera, whose spore structure has been similarly interpreted. As late as 1921 Reichert described on cotton leaves a long-beaked *Alternaria* as *Sporodesmium longipedicellatum* : he described the spores as 'conidiis oblongo-ovoideis, subclavatis, basi sensim in pedicellum attenuatis'. The real conidiophores were seen but thought to belong to another fungus. Between the dates 1836 and 1921 mycological literature bulges with descriptions of *Alternaria* spores so interpreted, usually under the name of *Macrosporium* but also of other genera. A number of figures also illustrate this interpretation.

The only diagnosis, however, to which reference will be made here is Saccardo's improvement of Penzig's description of *M. commune*. It will be remembered that in 1874 Saccardo gave *M. commune* as a synonym of *A. tenuis* and that in 1882 Penzig figured *M. commune* as having 'sarcinula' spores and described the spores as 'Conidiis forma et magnitudine variis'. In *Sylloge*, iv, p. 524, Saccardo compiled *M. commune* as a species distinct from *A. tenuis* ; after 'variis' he continues the description 'obovatis, oblongis, clavatis deorsum tenuatis' ; the oblong spores clearly refer to the 'sarcinula' spores figured by

Penzig; for the rest, surely we are where we were in 1836. Inverted, the description reads: 'ovate without a beak, ovate with a beak, finally drawn out finely'. On p. 525, *M. cheiranthi* is compiled, and the description there appears decisive: 'Conidiis . . . pyriformibus, ovato-clavatis basi producta appensis . . . vix diversum a *M. commune*'. Invert the diagnosis again: 'obpyriform, obovate-obelavate, extended into a produced beak'. . . . Hardly distinct from *Macrosporium commune*'. Surely Saccardo intended his description of *M. commune* to cover a mixture of 'sarcinula' and *Alternaria* spores. It appears to me to be absolutely certain that in *M. commune* as it now stands in Rabenhorst's *Kryptogamen-Flora*, ix, p. 226, the picture refers to one fungus, but that the accompanying description was framed to describe two fungi.

Finally Berlese's figure of *A. tenuis* in *Fungi moricolae*, fasc. vii, pl. 4. 1889, must be mentioned. Berlese, in error, as he explains in a foot-note,<sup>2</sup> drew the chain of spores as though their apical beaks were basal pedicels. Berlese's foot-note appears to have been overlooked, for this is the picture chosen in Rabenhorst's *Kryptogamen-Flora*, ix, p. 262, from which it has been copied again into other publications. It would almost appear as though it were accepted that Berlese's drawing is correct.

#### Provisional conclusion.

This very hasty outline goes to confirm the opinion previously expressed by Elliott (1917) and Bolle (1924) that the majority of species described in the genus *Macrosporium* Fr. belong to the earlier genus *Alternaria* Nees. Both authors agree in preferring to use the name *Alternaria* for these species.

They disagree entirely, however, in their suggestions as to how the genus *Macrosporium* should be used. Elliott says that, as two of the four original species of *Macrosporium* have been removed to the earlier genus *Alternaria*, the genus *Macrosporium* is fixed by the two remaining species which belong to *Clasterosporium*, as compiled by Saccardo. As the genus *Macrosporium* Fr. also antedates the genus *Clasterosporium* Schw. by two years, he would rename all the species which have been, up to this date, properly referred to *Clasterosporium* as species of *Macrosporium*.

Bolle agrees that, of the four original species of *Macrosporium* Fr., two belong to *Alternaria* Nees (1817) and two to *Clasterosporium* Schw. (1834), as these two genera are now universally interpreted. But she points out that the genus *Clasterosporium* Schw. is itself antedated by the genus *Sporidesmium* Link (1809), which was founded on the single species *S. atrum* Link. This species has no obvious conidiophores, and its spores have only cross-septa. Fries, in *Syst. Mycol.*, iii, p. 492,

<sup>1</sup> 'basi producta appensis'—literally, 'hung up on its produced base'.

<sup>2</sup> *Fungi moricolae* is not available at Kew. This information is extracted from a letter from Mr. Ramsbottom of the British Museum (Natural History).

accepted the genus *Sporidesmium* Link, and in addition to the type species included five other species in the genus; of these all but one species, *S. cellulorum* Fr., have spores with only cross-septa. Bolle would accordingly refer to the genus *Sporidesmium* Link all those species which have been called *Clasterosporium* up to now. In the *Sylloge* Saccardo has consistently used the genus *Sporidesmium* Link (which he spells *Sporodesmium*) for species with muriform spores, so that if Bolle's suggestion is accepted, in addition to altering the names of all the species of *Clasterosporium* to *Sporidesmium*, all the species in the latter genus will also have to be transferred to another genus.

Having disposed of the four original species of *Macrosporium* Fr., Bolle rejects this genus altogether. She is of opinion, however, that the name *Macrosporium* has been so long and consistently applied to species having 'sarcinula' spores and differentiated conidiophores that she would found the genus again on *M. sarcinula* Berk., but emending Berkeley's diagnosis of this species so as to exclude the 'Alternaria'-like spores described by Berkeley, which, however, doubtless do not belong to this species. There appears to be no possible justification for this practice under the present rules of nomenclature, but it is possible that it may be accepted by mycologists on the plea of usage. As was stated above, Bolle's nomenclature was accepted for indexing purposes for those species with which her paper dealt. The strict application of the whole of her findings would, however, have such wide repercussions that it is earnestly to be hoped that some measure of agreement may be reached as to the correct usage for these different genera.

**Alternaria** Nees (= *Macrosporium* Fr. p.p.).

**A. circinans** (B. & C.) Bolle in *Meded. Phytopath. Lab. Willie Commelin Sch.*, vii, p. 26, 1924.

On cabbage leaves; Coll. G. B. Wallace; Tanganyika; no. 942; Marangu; 13/5/27 and no. 957; Kirua Rombo; 26/5/27.

This name is provisionally accepted for the smaller spored and beakless species of *Alternaria* parasitic on *Brassica* spp. In *Kew Bulletin*, 1920, p. 299, Miss Wakefield records *Macrosporium brassicae* Berk. on leaves of cabbage; Kampala, Uganda. This record refers to the present species. Material examined: Dummer 1499 and Small 324 in Herb. Kew. In Herb. I.B.M. there is a specimen from Pusa, India, on cabbage: Coll. A. N. Khan; 7/1/23; labelled *A. brassicae* (Berk.) Sacc.; this again is *A. circinans*. A second collection from Pusa on sarson (*Brassica campestris* var.) is *A. brassicae* (Berk.) Bolle [= *Sporodesmium exitiosum* Kühn]. This latter is the species figured in Butler's *Fungi and Disease in Plants*, p. 301.

**A. longipes** (Ell. & Ev.) comb. nov.

*Macrosporium longipes* Ell. & Ev. in *Journ. of Mycol.*, vii, 2, p. 134, 1892.

Isolation from leaf spot of tobacco; Southern Rhodesia; J. C. Hopkins (no. 299); comm. March, 1928.

This is an *Alternaria* of the *A. solani* type, and is not obviously

distinct from that species. The isolation received was chromogenic. So far as I can find out, this species has not previously been referred to *Alternaria*. To secure consistency in listing, the change is made here.

**A. macrospora** Zimmerm. in *Ber. Land- u. Forstwirt. vom Kais. Gouvern. Deutsch-Ostafrika*, ii, p. 24 and pl. 3, fig. 13, 1904.

*Sporodesmium longipedicellatum* Reichert in *Englers Bot. Jahrb.*, 65, p. 723, 1921.

**A. longipedicellata** Snowden in *Uganda Rept.*, 1926, p. 31, 1927.

Material on cotton leaves; Ibadan, Nigeria; G. H. Jones (as reported in List I). On cotton leaves; Gold Coast; N. T. Clerk (C. B. 426); comm. R. H. Bunting, June, 1927. On cotton leaves; Trinidad; H. R. Briton-Nigeria; 14/12/26.

It now appears that no authentic material of *A. macrospora* is in existence either at Berlin or in Tanganyika: neither have specimens of the Indian records of *A. macrospora* become available for examination. On the other hand, the type specimen of *Sporodesmium longipedicellatum* Reichert has been examined; it is clearly an *Alternaria*. In leaf spot and fungus it matches exactly the material from Nigeria and the Gold Coast. In the material from Trinidad the leaf spot is not quite the same, but the fungus does not appear to differ materially.

*Isolations.* A culture was received from Nigeria (G. H. Jones; comm. February, 1926); an isolation from cotton leaves of a long-beaked *Alternaria* from Uganda (W. Small; comm. September, 1925), and an isolation was made from the Trinidad material. The strains from Uganda and Trinidad were strongly chromogenic on certain media; the Nigerian culture was not. Further, Mr. Jones reports that his numerous isolations have never developed a red or yellow coloration in the medium. A full morphological comparison of the three strains in culture proved nugatory, as free spore formation was only obtained in the Uganda strain. The few spores formed in the Nigerian isolation only formed long beaks occasionally; no spores were obtained in the Trinidad isolation. In the Uganda strain chains of two spores were frequently observed, and, in a very few cases, of three spores.

It is proposed to refer all the long-beaked *Alternaria* forms on cotton to *A. macrospora* Zimmerm. until proof is forthcoming that there are two good species of *Alternaria* on cotton whose spore length (with beak) can attain a length of 200  $\mu$ .

**A. solani** (Ell. & Mart.) Jones & Grout in *Vermont Agric. Exper. Stat. Bull.* 72, p. 25, 1899.

On potato leaves; Mwika, Tanganyika; G. B. Wallace (no. 953); 16/9/27.

#### ***Alternaria tenuis* group.**

**A. tenuis** Nees, Syst. d. Pilze u. Schwämme, p. 72, 1817:

*A. fasciculata* (Cke. & Ell.) Jones & Grout in *Bull. Torrey Bot. Club* xxiv, p. 257, 1897.

In this highly controversial group, differentiation of species has been found extremely difficult. Accepting the general account given by

Jones and Grout for *A. fasciculata* and Bolle's statement that *A. fasciculata* is a synonym of *A. tenuis* as studied by herself, it is possible to give a name to a considerable number of specimens received. All forms are here referred to *A. tenuis*, whose spores are obclavate, borne in long chains, and the majority of whose spores have 3 to 5 cross-septa, and, especially in culture, fall within the limits  $20$  to  $50 \times 10$  to  $14 \mu$ . With the great polymorphism shown by the spore form in each culture, the clue to differences of specific rank has not been elucidated, though variation in average spore size in different isolations is no doubt present. Subject to correction, the following records are all kept together as *A. tenuis* group.

N.B. In the most frequently copied figure of *A. tenuis* (by Berlese), the spore-chain is shown attached by its apical instead of its basal end. In Stevens's *Fungi that cause plant disease*, fig. 422, 1919, a spore-chain of *A. fasciculata* (= *A. tenuis*) by Jones and Grout is included under the label *A. solani*.

On cotton leaves as '*Alternaria* disease of Cotton'; Tokar, Sudan; R. E. Massey; January, 1927. On different cotton leaf spots; Mafisa, nr. Morogoro (no. 1219); 31/10/27; and Kilosa (no. 1197); 15/9/27; Tanganyika; G. B. Wallace.

This is the *Alternaria* which Atkinson stated frequently to follow *Macrosporium nigricantium* on cotton leaves. He figured it in *Alabama Agric. Exper. Stat. Bull.* 41, pl. 1, fig. 5, and later referred it tentatively to *A. tenuis* (*U. S. Dept. of Agric. Bull.* 33, p. 282, 1896). *M. gossypinum* Thüm. (Herb. Mycol. Oeconom. no. 513: issued 1877) on cotton stems from S. Carolina is an *Alternaria* and no doubt this species. Material examined; *M. gossypinum* Thüm., Mycotheca Univ. no. 1469 in Herb. Kew.

On dew-retted flax straw; Cyprus; Director of Agriculture; comm. December, 1926. Spore measurements on the host, 26 to 66 ( $30$  to  $50$ )  $\times$   $10$  to  $15$  ( $11$  to  $14$ )  $\mu$ ; in culture,  $13$  to  $40 \times 6$  to  $13 \mu$ .

From tobacco leaves; Rhodesia; isolation  $\frac{181}{83}$  from J. C. Hopkins; comm. September, 1927. Spore variation  $13$  to  $46 \times 9$  to  $16 \mu$ .

This is presumably *M. tabacinum* Ell. & Ev., *Journ. of Mycol.*, vii, p. 134, 1892, described on tobacco leaves with sessile spores  $15$  to  $25 \times 10$  to  $12 \mu$ , and with larger spores  $35$  to  $45 \times 8$  to  $12 \mu$ , with a distinct stipe  $8$  to  $12 \mu$  long. As so often happens, the apical beaks were no doubt taken for proximal stalks. [In 1894 (*Proc. Acad. Nat. Sci. Philadelphia*, 1894, p. 383) they described *M. tabacinum* again with conidia  $50$  to  $90 \times 10$  to  $15 \mu$ .] In 1908, S. Hori in Japan (*Formosa Agric. Exper. Stat. Bull.* i, pt. 1, p. 33) recognized Ellis and Everhart's fungus again; observed that it formed its spores in chains; and referred it to *Alternaria* as *A. tabacina* (Ell. & Ev.) Hori. A figure shows chains which would pass very well for *A. tenuis*. No material under either of these names is available for comparison.

In 1892 Saccardo determined as *A. tenuis* an *Alternaria* on tobacco

seedlings with spores 30 to  $40 \times 12$  to  $15 \mu$ . (*Zeitschr. f. Pflanzenkr.*, ii, p. 330, 1892).

On orange fruit as stem end rot of oranges from Southern Rhodesia; communicated through British South Africa Company; November, 1924. Purchased oranges in Great Britain; G. H. Pethybridge; January, 1925. Oranges in store; Cambridge, England; R. E. Tompkins; December, 1926.

In 1902 Pierce founded *A. citri* on an *Alternaria* causing black rot of citrus fruit (*Bot. Gaz.*, xxxi, pp. 234, 235, 1902). It is not to be doubted that the black rot disease in the present specimens is the same. In 1903 Saccardo described *A. tenuis* var. *chalaroides* attacking the fruit of mandarin (*Citrus deliciosus*) in Italy (*Ann. Mycol.*, i, pp. 225-227, 1903). He described an endoconidial stage inside the fruit, but the *Alternaria* which grew out from the fruit when placed in a damp chamber was *A. tenuis*.

On leaf spot of lemon; S. Africa; Miss E. M. Doidge; comm. November, 1924.

On leaf spot of orange; Marangu, Tanganyika; G. B. Wallace (no. 941); 13/5/27.

Miss Doidge states (in litt.) that her own isolation causes a leaf spot of lemon on inoculation. An authentic culture of *A. mali* Roberts, a culture of *A. citri* Pierce from the Centraalbureau, Baarn, and Miss Bolle's culture of *A. tenuis* all failed to produce the leaf spot on inoculation; all the cultures, however, produced the black rot of orange fruit.

*A. tenuis* has been recorded on dry leaf spots of *C. aurantium* and *C. limonum* by Penzig in Italy (*Michelia*, ii, p. 477, 1882). McAlpine records *M. citri* on lemon leaves (*Fungus Diseases of Citrus*, p. 91 and figs. 68 and 69, 1899). From his figures, this is an *Alternaria* and not a *Macrosporium*, as here used; if discovered again, it will perhaps be difficult to differentiate from the present forms.

On diseased grain of *Sorghum barbuda*; Serere, Teso, Uganda; J. D. Snowden (no. 999); 2/8/26.

*A. tenuis* was recorded on sorghum leaves from Italy by Saccardo (*Michelia*, i, p. 270, 1878).

On leaves of sugar-cane; India; K. R. Mohendra; comm. October, 1925. (Spore variation in first isolations 16 to 50 (18 to 36)  $\times$  9 to 17 (10 to 14)  $\mu$ .)

This was the first fungus to develop on large dead areas on some sugar-cane leaves, and Mr. Mohendra thought that it might possibly be causal. He studied the fungus in culture and got peculiar saltants. Spegazzini has recorded *A. tenuis* as extremely abundant on dead sugar-cane in Tucumán.

**Macrosporium** Bolle in *Meded. Phytopath. Lab. Willie Commelin Scholten*, vii, p. 69, 1924.

*Thyrospora* Tehon & Daniels in *Phytopath.*, xv, p. 718, 1925.

As stated above, Bolle selects as the type species of *Macrosporium*, *M.*

*sarcinula* Berk. In addition to its 'sarcinula' spores, the species is characterized by the differentiated conidiophores, which are a little inflated at the apex and are said to continue their growth through the scar left by the terminally-borne conidium. Tehon and Daniels founded their new genus *Thyrospora* on *Macrosporium sarcinaeforme* Cav. According to Bolle, *M. sarcinula* Berk. and *M. sarcinaeforme* Cav. both develop *Pleospora herbarum* in culture and should be called by the same specific name. Elliott used the name *M. sarcinaeforme* for a fungus with similarly differentiated conidiophores, and *M. sarcinula* for a fungus isolated from apple with a simple conidiophore. (On the fruit and in the first cultures this latter fungus developed sclerotial structures; these were presumably immature perithecia.) He decided that they were two fungi 'entirely dissimilar except in general form of spores, yet they appeared equally parasitic on red clover and alfalfa, and both were feebly parasitic on onion tops.' The name *M. sarcinula* Berk. emend. Bolle is here accepted for the organism with 'sarcinula' conidia which develops *P. herbarum* perithecia in culture, and whose conidiophore shows different degrees of development of an apical swelling.

***M. sarcinula* Berk. emend. Bolle, loc. cit.**

Isolated from dew-retted flax straw; Cyprus; Director of Agriculture; comm. December, 1926.

Isolated from olive fruit; Glen Forest, Western Australia; W. M. Carne; comm. November, 1928.

The *Macrosporium* on retted flax straw was stated to be uncommon but distinctly deleterious to the flax straw. Both on the host and in pure culture *Pleospora herbarum* (Pers.) Rabenh. developed. In culture the somewhat scanty conidia measured  $14$  to  $32 \times 10$  to  $19 \mu$  (mean  $23.6 \times 14.4 \mu$ ). In culture the ascospores (with 7 cross-septa) measured  $29$  to  $40 \times 13$  to  $16 \mu$  (mean  $33 \times 15 \mu$ ).

The isolation from olive developed fertile perithecia of *P. herbarum* in the first transfers; in further cultures the perithecia have remained sterile.

As mentioned above, a number of workers have connected by pure cultures a 'sarcinula' conidial form with a *Pleospora* with 7-septate ascospores; among these may be mentioned the following:

(1) Miyake, K., in *Annals of Botany*, iii, pp. 1-25, pl. I and II, 1889, worked with the onion parasite. He concluded that *M. parasiticum* Thüm. was a synonym of *M. sarcinula* Berk., and that it belongs to *Pleospora herbarum*. His work with the onion parasite has been confirmed in every particular by Teodoro, N. G., in *Philippine Agric. Rev.*, xvi, 4, pp. 233-275, 20 pl., 1923.

(2) Brefeld, O., in *Untersuchungen*, x, p. 227, stated that he secured *M. commune* Rabenh. in cultures started from the ascospores of *P. herbarum*; his figures show that his conidial stage was really a *Macrosporium* of the *M. sarcinula* type.

(3) Bolle (loc. cit.) secured numerous isolations of species with 'sarcinula' spores which gave *P. herbarum* in culture. She decided that

all the conidial forms which behave likewise should be called *M. sarcinula*.

(4) Horne and Horne in *Annals of Applied Biology*, vii, p. 190, 1920, recorded that with cultures of *Pleospora pomorum* Horne, from apple fruit, started both from single ascospores and conidia, the connexion between these two stages was proved. The ascospores had 7 cross-septa, and the conidia (stated to be of the *Stemphylium pyriforme* type) would pass as *Macrosporium* of Bolle. Figures are given of both stages.

(5) Marchal, El. and Em., recorded *Pleospora lycopersici* spec. nov., whose ascospores have 5, 6, or more frequently 7 cross-septa, as the perfect stage of *M. sarcinaeforme* Cav. on tomato fruit. They were working with pure cultures (see *Bull. Soc. Roy. Bot. Belgique* liv, pp. 8 and 9, 1921).

(6) Klebahn confirmed the connexion of *Pleospora sarcinulae* (with ascospores with 7 cross-septa) with *M. sarcinula* (*Haupt- und Nebenfrucht. d. Askom.*, p. 172 et seq., 1918).

(7) Rose and Butler isolated from lemons and apples a species of *Pleospora* which they referred to *P. herbarum* var. *citrorum*. They proved its connexion with a *Macrosporium* conidial stage with single-spore cultures started from both ascospores and conidia (see abstract in *Phytopath.*, xvii, p. 47, 1927).

(8) Newton isolated from apples and described as new a *Pleospora mali* with 6 or 7 cross-septa, and proved its connexion with a conidial form which his figures show to be of the *M. sarcinula* type (see *Phytopath.*, xviii, pp. 565-578, 1928).

It would not appear probable that all the different specific names here mentioned can be seriously maintained as distinct entities, at any rate in our present state of knowledge, but rather that Bolle is right in provisionally referring all such forms to one species. If Bolle's usage of the genus *Macrosporium* is definitely rejected, so far as is known, *Thyrospora* Tehon & Daniels will stand as the correct generic name to which the conidial stage of *Pleospora herbarum*, with its 'sarcinula' spores and differentiated conidiophores, should be referred.

#### ASPERGILLUS MICHELI EMEND. CORDA

**A. flavus** Link, *Observationes*, p. 16, 1809.

Isolation from cacao beans; Gold Coast; R. H. Bunting (A); comm. June, 1927.

Isolation from tea roots; Ceylon; W. Small (no. 2); comm. November, 1926.

Sclerotial strain isolated from paddy soil: Burma; D. Rhind (no. 7); comm. August, 1927.

**A. fumigatus** Fresen., *Beiträge z. Mykol.*, p. 81, 1850.

Isolation from cacao beans; Gold Coast; R. H. Bunting (F); comm. June, 1927.

**A. niger** van Tiegh. in *Annal. Sci. Nat. Bot.*, sér. 5, viii, p. 240, 1867.

On cotton as 'Smut blight of seed' of American and Egyptian

cotton grown in Spain; G. C. Dudgeon; comm. October, 1926. In cotton bolls; Kisumbi, Tanganyika; G. B. Wallace; comm. August, 1926. On bolls and in seeds; Kilosa, Tanganyika; G. B. Wallace (nos. 1203 and 1221); 17/9/27.

This fungus is one of the commonest invaders of cotton seeds and lint in the tropics. It was received at Kew as early as 1872 as 'Black Blight' of naturalized American cotton from Dharwar, India. Cooke recognized the fact that the spores were borne in chains but overlooked the *Aspergillus* heads, and named the fungus *Torula incarcerationata* (Grevillea, i, p. 90, 1872). On re-examination of the type specimen in Herb. Kew. the spores were found to match those of *Aspergillus niger* exactly, and a few *Aspergillus* heads were found inside the cotton seed.

N.B. The Kisumbi specimens were first referred to *A. phoenicis*, which differs only in the larger primary sterigmata, 30 to 50  $\mu$ ; in the other specimens the primary sterigmata hardly exceed 30  $\mu$ . It does not, therefore, appear profitable to have two names for these members of the *A. niger* group in cotton bolls unless further points of difference should appear.

Isolation from tea roots; Ceylon; W. Small (no. 7); comm. November, 1926. No doubt a soil isolation.

Isolation from paddy soil; Burma; D. Rhind (no. 3); comm. August, 1927. Rather more purple in culture than normal.

Isolation from cacao beans; Gold Coast; R. H. Bunting (C); comm. June, 1927.

**A. repens** (Corda) Sacc., *Sylloge*, iv, p. 64, 1886.

On American cotton seed grown in Spain; G. C. Dudgeon; comm. October, 1926.

**A. tamarii** Kita in *Centralbl. f. Bakt.*, Abt. II, Bd. xxxvii, p. 433, 1913.

Isolation from cacao beans; Gold Coast; R. H. Bunting (B); comm. June, 1927.

Isolation from paddy soil, Burma; D. Rhind (no. 10); comm. August, 1927.

**A. terreus** Thom in *Amer. Journ. of Bot.*, v, pp. 85-86, 1918.

Isolation from paddy soil; Burma; D. Rhind (no. 1); comm. August, 1927.

#### BASISPORIUM AUCT. NON MOLLIARD

**B. gallarum** Dale in *Ann. Mycol.*, x, pp. 466-467, 1912.

nec. *Basisporium gallarum* Molliard, *Bull. Soc. Mycol. Fr.*, xxviii, p. 120, 1902.

Miss Dale's soil isolation, which is still deposited under this name at the Centraalbureau voor Schimmelcultures, has twice been under study. No conclusion has been reached as to its correct systematic position, though it appears to be closely related to, though not identical with, the fungus listed as ? *Mycogone nigra* Jensen. It is believed that other records of *B. gallarum* as a soil organism refer to this or a closely allied species, and not to species of *Nigrospora* Zimmermann (= *Basisporium*

Molliard). [N.B. Dr. Waksman states (in litt.) that the isolation from iron soil, which he referred to *B. gallarum*? Molliard (*Soil Science*, ii, p. 136, 1916) was lost in the war. He has, however, been good enough to grow and examine the present culture carefully, and thinks that Miss Dale's culture is quite similar to his own isolation.]

#### BEAUVERIA VUILLEMIN

**B. globulifera** (Speg.) Picard in *Annales du Service des Épiphyties*, i, p. 160, 1913.

Isolation from rose feather moth by W. C. Moore; Harpenden, England; comm. G. H. Pethybridge, July, 1927.

This isolation is not apparently different from those referred in List I to this species. Picard recognized three species of *Beauveria* with globose spores, differing only in the amount of aerial mycelium and in the coloration produced in the medium. In particular *B. bassiana* (Bals.) Vuillemin had been stated by Beauverie to show no aerial mycelium in artificial culture or on the host (see *Lab. d'Études de la Soie*, xiv, pp. 55-81, 1911). Petch has discussed the genus in *Trans. Brit. Mycol. Soc.*, x, 4, pp. 244-271, 1926; in particular, he points out that it is very doubtful if Picard really had the true *Sporotrichum globuliferum* Speg., and he throws doubts on the permanence of the colour characteristics, as displayed on culture media, of the different fungi of this genus. It may be that with further experience it will not be possible to separate as different species the strains of *Beauveria* with globose spores, in which case they will all presumably have to be referred to the type species of the genus *B. bassiana* (Bals.) Vuill.

#### BENIOWSKIA RACIBORSKI

**B. sphaeroidea** (Kalchbr. & Cke) comb. nov.

*Ceratium sphaeroideum* Kalchbr. & Cke. in *Grevillea*, ix, p. 22, 1880.

*Aegerita penniseti* P. Henn. in *Hedwigia*, xliii, p. 153, 1904.

*Beniowskia penniseti* Wakef. in *Kew Bull. Misc. Inform.*, 1920, pp. 75-76.

'White Rust. *Albugo*, sp. nov.' Eyles in *Preliminary List of Plant Diseases recorded in Southern Rhodesia*, p. 13, 1926.

On *Setaria aurea*; Thika, Uganda; T. W. Kirkpatrick; 24/6/26; comm. J. McDonald, September, 1926.

On *Panicum palmifolium*; Ruw Estate, Mlanje, Nyasaland; E. J. Butler; 6/3/27.

Authentic material examined: '*Ceratium sphaeroideum* K. & C. on *Andropogon marginatum*. Cape, Macowan 1284' in Herb. Kew. '*Aegerita penniseti* P. Henn. on *Pennisetum japonicum* Trin. Engyoji, Tosa. Oct. 1907. Miss T. Yoshinaga', ex Herb. Berlin. '*Beniowskia penniseti* Wakefield. Type on leaves of *Pennisetum purpuraceum*. Kampala, Uganda. Small 25' in Herb. Kew. 'White fungus on leaves of *Setaria verticillata*' ex Eyles's Herbarium no. 2065.

In addition to the above, there is, in Herb. Kew., a specimen of this

fungus on *Chaetochloa poiretiana* from St. Clair, Trinidad, determined by Stevens and Manter as *B. penniseti*.

The type species of *Beniowskia*, *B. graminis* Racib., 1900, differs, from its description, only in the presence on the sporodochia of long curly hairs. It would appear very doubtful if this distinction can finally be maintained. Miss Wakefield points out that *Clathrotrichum subcarneum* Pat. gen. nov., spec. nov., described in *Bull. Soc. Mycol. Fr.* xxxvii, pp. 33-35, 1921, is, from the figure and description, a *Beniowskia*. and, if *B. graminis* is a distinct species, should probably be referred to it.

#### BOTRYOSPORIUM CORDA 1839 (? CORDA 1828)<sup>1</sup>

**B. longibrachiatum** (Oudem.) Maire in *Ann. Mycol.* i. p. 341. 1903.

Isolated from dying *Dracaena* sp. [recorded in List I as *Botryosporium elegans* Corda synonym. *B. longibrachiatum* (Oudem.) Maire].

The species of *Botryosporium* have been discussed by von Höhnelt in *Fragmente zur Mykologie*, no. 717, and by Maire in a final notice in *Bull. Soc. d'Hist. Nat. de l'Afrique du Nord*, xviii, 7, pp. 185-188, 1917.

In the first place, as von Höhnelt has pointed out, the name *B. elegans* Corda (1841) has no status at all, being merely due to a *lapsus calami* on Corda's part when he was republishing portions of his figures of *B. pulchrum* (1839).

With regard to the species of *Botryosporium* with elliptical (not globose) spores, von Höhnelt considered that there might be two good species which he recognized as *B. pyramidale* (Bon.) Cost. and *B. pulchrum* Corda. [This last species he regarded as the earliest name applied to the fungus here recorded as *B. longibrachiatum* (Oudem.) Maire and *Radaisiella elegans* Bainier.] Von Höhnelt did not, however, commit himself to a definite statement of the characters separating the two species.

Maire states definitely that there are two good species of *Botryosporium* with oval spores, that he has had them both in culture, and that he can distinguish them quite easily. In the first the conidiophores are dichotomously branched and the conidial heads are simple, i. e. in each conidial head the conidia are borne on a simple sub-globose vesicle. The real structure of the conidial heads of this species was first demonstrated by Costantin in 1888 under the name *B. pyramidale* Cost., but Corda's habit sketch of his *B. pulchrum* 1839 shows that he really had this species. Maire accordingly accepts the name *B. pulchrum* Corda for this species.

The second species is characterized by its conidiophores not being dichotomously branched, but more especially by its lobulate conidial heads, i. e. the vesicles bearing the conidia, instead of being simple and subglobose, are 4- or 5-lobed. For this species he uses the name *B. longibrachiatum* (Oudem.) Maire, and cites *Radaisiella elegans* as a synonym. As Maire points out, Bainier was so impressed with the lobulate character of the heads of this fungus that he proposed the genus *Radaisiella* for this 'compound' *Botryosporium*. [Ferraris has

<sup>1</sup> *B. diffusum* Corda 1828. *B. pulchrum* Corda 1839.

also figured this species unmistakably in *Flora Italica*, *Hypphales*, fig. 162, but under the name of *B. pulchrum* Corda.]

It seems not a little strange that such a characteristic fungus should not have received a name by which it can be recognized before Oudemans called it *Botrytis (Phymatotrichum) longibrachiatum* in 1890, and it is worth while considering whether the fungus which Albertini and Schweinitz named *Botrytis diffusa* in 1805 can be anything but this same fungus.

As is well known, Albertini and Schweinitz, when they first described their fungus, mistook the conidial bearing apparatus for the spores themselves. (In this they were followed by Fries, who compiled the fungus as *Stachylidium diffusum*.) They described 'sporulae . . . subquaternae, subglobosae', which finally gave rise to a 'fumum seminale'. Their 'fumum seminale' no doubt consisted of the spores themselves, which they did not, however, further describe. If their fungus really was a *Botryosporium* (and it is always listed as one), their 'sporulae subquaternae, subglobosae' can only refer to the 4- or 5-lobed vesicles on which the spores were borne; and if there is only one species of *Botryosporium* with compound heads, *Botrytis diffusa* A. & S. and *Stachylidium diffusum* (A. & S.) Fr. must be earlier names for the fungus Maire is calling *Botryosporium longibrachiatum* (Oudem.) Maire.

Two British records which claim to refer to *Botrytis diffusa* A. & S. appear to be misdeterminations. Berkeley recorded '*Stachylidium diffusum* Fr.' as common in Northamptonshire in Smith, *English Flora*, v, pt. 2, p. 341, 1836. He notes that Albertini and Schweinitz, as also Fries, describe 'primary quaternate spores', but refrains from confirming the observation. He describes the real spores as 'globose or sometimes elliptic sporidia'. He later figured the fungus which he referred to this species in *Outlines of Cryptogamic Botany*, p. 314, fig. 71 c, 1857. A lucky preparation of material from Berkeley's Herbarium in Herb. Kew. shows that he was dealing with the fungus Maire is calling *Botryosporium pulchrum* Corda. The spores are truly elliptic. *B. pulchrum* was also recorded and figured as British by Miss Lorraine Smith in *Trans. Brit. Mycol. Soc.*, iii, p. 1, pl. 1, fig. 1, 1907. Her figures show decisively that she was dealing with the same fungus.

In 1900 Jaczewski also determined as *Botryosporium diffusum* Corda a third species (see *Zeitschr. für Pflanzenkrankh.*, x, p. 147). He described and figured the spores as oval; he also figured the vesicles bearing the spore heads as simple and subglobose. He issued an exsiccatum under this name in Vestergren 'Microm. var. selecti no. 421'. Maire definitely determines this exsiccatum as the fungus he is now calling *B. pulchrum* Corda.

Von Höhnelt has, however, pointed out a fact which may give rise to serious trouble later; that what is probably a different sort of fungus has been determined as *Botrytis diffusa* A. & S.

Greville at Edinburgh, Scotland, described and figured a fungus which he referred to *Botrytis diffusa* A. & S. (see *Scotch Cryptogamic Flora*, iii,

pl. 126 B. 1825). There is no suggestion that the heads of spores are compound, and the spores he describes and figures as globose. Since the real structure of *Botryosporium* was elucidated by Costantin no species has been recognized with globose spores: and there is no evidence at all that any species of *Botryosporium*, as now understood, has globose spores. No material of Greville's fungus is now in existence at Kew or Edinburgh, and it is quite impossible to say what fungus he really had. But it was on this determination of Greville's that Corda founded the genus *Botryosporium* in 1828. He named his species *B. diffusum* Corda, and again described and figured it with globose spores; he cited both Albertini and Schweinitz and also Greville as having had the same fungus. It would appear very improbable that a true species of *Botryosporium*, as the genus is now understood, with globose spores, could have been overlooked. The point will only become important if the type species method of fixing genera becomes established.

It thus appears probable that *Botrytis diffusa* A. & S. has been determined as three distinct fungi.

(1) There is the original fungus *Botrytis diffusa* A. & S. (= *Stachylidium diffusum* Fr.) with 'Sporulae . . . subquaternae, sub-globosae', which, it appears to me, must be the species with compound conidial heads, i.e. the *Botryosporium longibrachiatum* (Oudem.) Maire. It has been unmistakably figured by Bainier under the name of *Radaisiella elegans* Bain., and by Ferraris under the name of *Botryosporium pulchrum* Corda. It is also the species which von Höhnelt considered to be undoubtedly *B. pulchrum* Corda.

(2) *Stachylidium diffusum* of Berkeley and *Botryosporium diffusum* of Jaczewski. This is the species which is referred by Maire and Miss Lorraine Smith to *B. pulchrum* Corda. It has been unmistakably figured by Costantin under the name *Botryosporium pyramidale* (Bon.) Cost.

(3) *Botrytis diffusa* of Greville and *Botryosporium diffusum* of Corda, with simple heads and globose spores. This is a still unrecognized fungus which is, however, the type species of the genus *Botryosporium*.

#### CALOSTILBELLA VON HÖHNEL

'*C. calostilbe*' von Höhnelt in *Centralbl. f. Bakt.*, Abt. 2, Bd. lx, p. 11, 1923 [= the conidial stage of *Calostilbe striospora* (Ell. & Ev.) Seaver in *Mycologia*, xx, p. 248, 1928].

On stems of cacao; Manacol, Caura, Trinidad; S. F. Ashby; October, 1924: and an isolation started from the ascospores of the perithecial stage.

It is convenient to discuss this species here under the name of its imperfect stage. Under a hand-lens the fungus appears as a red-brown head of spores about  $1\frac{1}{2}$  mm. in diameter supported on a stalk 1 cm. long and upwards. The oblong spores are 3-septate: the two central cells are yellow-brown, and the two end cells hyaline and smaller than the central ones. The spores measure up to  $50 \times 15 \mu$  and have broadly obtuse ends.

This conidial stage was apparently first described by Møller as belonging to his *Sphaerostilbe longiasca*, and again by Ashby as belonging to his *S. musarum*, which latter species is now considered as a synonym of the former. *S. longiasca* Møll. was made by Saccardo and Sydow the type species of a new genus *Calostilbe*, which they separated from *Sphaerostilbe* by the possession of brown ascospores and a conidial stage resembling '*Arthrosporium*' (see *Sylloge*, xvi, p. 591). Von Höhnelt considers that the conidial stage is not an *Arthrosporium*, and made it the type species of a new genus *Calostilbella* and named it *Calostilbella calostilbe* von Höhn. Finally, Seaver has found an earlier name for the perithecial stage, which he has renamed *Calostilbe striispora* (Ell. & Ev.) Seaver.

The imperfect stage, *Calostilbella calostilbe*, has previously received what are at any rate herbarium names. Mr. Ashby recognized his fungus in a specimen in the *Didymostilbe coccinea* folder in Herb. Kew. The specimen is labelled in Massee's handwriting '*Hartiella erythrocephala* nov. gen. and sp. no. 1009 . . . on dying cocoa tree. Collector W. E. Broadway. Locality Santa Cruz [Trinidad] . . . May, 1908'. The specific name '*erythrocephala*' has been crossed out by another hand and '*coccinea*' substituted.

The genus *Hartiella* was founded by Massee in *Kew Bull.*, 1910, p. 5, on the single species *H. coccinea*, which grew on the shell of a cacao pod from Trinidad collected by Broadway. He described the spores as 1-septate, red, and measuring  $7$  to  $9 \times 4$  to  $5 \mu$ .

Saccardo, compiling this species in *Sylloge*, xxii, on p. 1446, stated that in its diagnosis the genus *Hartiella* did not differ from *Didymostilbe* P. Henn., and renamed the fungus *D. coccinea* (Mass.) Sacc.

There is no material in existence at Kew or in Trinidad which is labelled by Massee *Hartiella coccinea* or which corresponds to his description, or at any rate to his description of the spores. A specimen at present in Herb. Kew., and on loan from the Department of Agriculture, Trinidad, is labelled '*Hartiella trichocoma* Mass. no. 2282 on dying cacao tree. Coll. Broadway, Santa Cruz, Aug. 1908', and is again *Calostilbella calostilbe*.

No diagnosis of *Hartiella erythrocephala* Mass., or of *H. trichocoma* Mass., was ever published, and there is no knowledge, either at Kew or in Trinidad, of any red fungus on the shell of the cacao pod which corresponds to the diagnosis of *H. coccinea*.

The present collection was gathered by Ashby on cacao in Trinidad in 1924; and Seaver (in *Mycologia*, xx, p. 54, 1928) records a substantial collection in Trinidad on the bark of an unknown tree, which he now believes to have been cacao. It appears worth while to record further that Broadway twice collected the same fungus on dying cacao in Trinidad in 1908.

## CEPHALOSPORIUM CORDA

**C. acremonium** Fresen. *Beiträge z. Mykol.*, iii, pp. 94-95 and pl. xi, figs. 59-63, 1863.

(?) *Cephalosporium acremonium* Corda, *Icones Fungorum*, iii, p. 11 and fig. 29, 1839.

Isolation from black bundle of maize; Gold Coast Colony; R. H. Bunting (Culture <sup>1883</sup><sub>2</sub>).

Isolated from seed of timothy grass (*Phleum pratense*); received from Aberystwyth, N. Wales; Miss K. Sampson.

As Reddy and Holbert have pointed out in *Journ. Agric. Res.*, xxvii, 4, pp. 177-205, 1924, there is great doubt as to what fungus Corda had. In any case a number of distinct fungi have been referred to his fungus. It is quite safe, however, to determine the *C. acremonium* which Fresenius described on maize leaves. Only *Cephalosporium* heads of spores are formed, the spores generally not exceeding  $5\mu$  in length. The isolation from timothy did not appear to me to differ.

**C. lecanii** Zimmerm. Over een schimmelepidemie der groene luizen. *Korte Berichten uit's Lands Plantentuin*. 1898 [not seen].

On scale insects on coco-nut; Sierra Leone; comm. D. W. Scotland; December, 1924: also comm. Commissioner of Lands and Forests, Sierra Leone; July, 1925. On (?) *Lecanium oleae* on *Citrus limonum*; Auckland, New Zealand; G. H. Cunningham; 20/1/24.

This fungus appears to be closely related to *C. acremonium* Fresen. Following Petch. there is no morphological distinction between the entomogenous fungi *Cephalosporium lecanii* Zimmerm., *Hyalopus yvonis* Dop. and *Acrostalagmus coccidicola* Guégen. (See *Trans. Brit. Mycol. Soc.*, x, 3, pp. 152-166, 1925.)

## CERCOSPORA FRESENIUS

**C. apii** Fresen. *Beiträge z. Mykol.*, iii, p. 91 and taf. xi, figs. 46-54, 1863.

On celery; Nduruma, Tanganyika; G. B. Wallace (no. 1164); 23/6/27.

**C. cruenta** Sacc. *Michelia*, ii, p. 149, 1880.

On cowpea; Kirua Rombo, Tanganyika; G. B. Wallace (no. 1032); 27/5/27.

**C. cucurbitae** Ell. & Ev. in *Journ. of Mycol.*, iv, p. 3, 1888.

On pumpkin; Kilosa, Tanganyika; G. B. Wallace (no. 1187); 17/9/27.

**C. gliricidiae** Syd. in *Philipp. Journ. Sci.*, Sect. C. (Bot.), viii, 4, p. 283, 1913.

On *Gliricidia maculata*; Porto Rico; comm. B. A. Bourne; 1924.

This does not appear to be different from the fungus which is so frequent on *Gliricidia sepium* in the Philippines.

'**C. gossypina** Cke' in *Grevillea*, xii, p. 31, 1883. [Conidial stage of *Mycosphaerella gossypina* (Atk.).]

On cotton leaves: Mozinga, nr. Morogoro, Tanganyika; G. B. Wallace (no. 1179); 13/9/27. Pallisa, Bugwere, Uganda; J. D. Snowden (no. 993); 2/8/26.

- C. henningsii** Allesch. in P. Henn. in *Die Pflanzenwelt Ostafrikas*, Teil C., p. 35, June, 1895.  
*C. cassavae* Ell. & Ev. in *Bull. Torrey Bot. Club*, xxii, 10, p. 438, October 31, 1895.  
*C. manihotis* P. Henn. in *Hedwigia*, xli, p. [18], 1902.  
*Septogloeum manihotis* Zimmerm. in *Centralbl. f. Bakt.*, Abt. 2, Bd. viii, No. 7, p. 218, Feb. 1902.  
*C. manihotis* P. Henn. apud Wildeman in *Annales du Musée du Congo*, Bot. Ser., Vol. 2, fasc. 2, p. 104, 1907.  
 On cassava (*Manihot* ? *Aipi*); Asamangkese, Gold Coast; H. A. Dade (C. B. 312); September, 1925.  
 On *Manihot utilissima*; Marangu, Tanganyika; G. B. Wallace (no. 943); 13/5/27.

This species was recorded in List I as *C. henningsii* Allesch., and *Septogloeum manihotis* Zimmerm. was noted as a synonym. The determination was based on two specimens from Uganda, Dummer 1348 and Small 170, referred by Miss Wakefield to this species in *Kew Bull.*, 1920, p. 299. In 1925 Van Overeem published a paper on this species. From a consideration of the diagnoses, he decided that there was no difference between the descriptions of *Cercospora cassavae* Ell. & Ev. from Florida, *C. manihotis* P. Hennings from the Belgian Congo, and *C. henningsii* Allesch. apud Hennings from Tanganyika. He gave the date of these three species as 1895, 1907, and 1908 respectively, and accepted the name *C. cassavae* Ell. & Ev. as the earliest name for the species.

Authentic material of *C. cassavae* in Herb. Kew. was checked, and the name accepted in *R.A.M.*, v, p. 144, as the correct name for the species; a note was added that *Septogloeum manihotis* Zimmerm. was another synonym. Consideration of the literature has brought to light the following facts:

I. *C. henningsii* Allesch. was founded in 1895, and antedates *C. cassavae* Ell. & Ev. by three months.

II. *C. manihotis* P. Henn. was founded in 1902 on material from Brazil.

III. *C. manihotis* was again made a new species by Hennings, with a rather different diagnosis in 1907, on material from the Belgian Congo.

IV. When Hennings founded *C. manihotis* for the first time (in 1902) he stated that it was quite different from *C. henningsii* Allesch. 'Die Art ist von *C. henningsii* All. gänzlich verschieden.'

V. In addition to this, compilations of regional lists of fungi in some cases record two of these names as occurring on the host *Manihot* in the same region, e.g. *C. henningsii* and *C. manihotis* have both been recently compiled in lists from the Philippines and from the Belgian Congo; and *C. henningsii* and *Septogloeum manihotis* are both recorded from Tanganyika Territory.

It seemed from this that some one might somewhere have differentiated two species of *Cercospora* on *Manihot*, and it appeared desirable to examine authentic material of the relevant species. The folders of

*C. henningsii* and *C. manihotis* were accordingly obtained on loan from the Dahlem Museum, Berlin. Spores of the common 'Manihot' *Cercospora* were found on type material of *C. henningsii* and of *C. manihotis* (both 1902 and 1907); the diagnoses describe these spores quite recognizably, and so the name *C. henningsii* is adopted for the fungus under discussion.

The fungus was first received at Berlin on material of the 'Kräuselkrankheit' disease of cassava [a mosaic disease]. Hennings forwarded the material to Allescher, who drew up a diagnosis of *C. henningsii*, to which he attributed the 'Kräuselkrankheit' of cassava; this description was published by Hennings in 1895. The only material under this name now in existence at Berlin consists of one envelope, enclosing a leaf and labelled *Typus*, and two other leaves stuck on to the same sheet. The leaf in the envelope shows a number of pellucid areas, but no trace of fungus could be seen. On the leaves stuck on the sheet the areas had begun to wither, and it was on one of these dead areas that a little poorly developed *Cercospora* was found.

The next collection received at Dahlem Museum was from Brazil, and constituted the type material of *C. manihotis* P. Henn. 1902. This material shows typical leaf spot of *Manihot* sp., and the 'acervuli' are fully developed. It is to be presumed that Hennings considered it different from *C. henningsii* as the leaf spots gave no indication of 'Kräuselkrankheit' disease.

The third and last collection received at Dahlem constitutes the type material of *C. manihotis* 1907.

To sum up, the fungus has only been received at Dahlem three times, and was named by Allescher *C. henningsii* and by Hennings, twice, *C. manihotis*. There does not appear to be any evidence that Hennings ever referred a collection to *C. henningsii*.

In 1902 Zimmermann described his *Septogloeum manihotis* in Java; he shortly afterwards moved to Tanganyika, and promptly recognized his fungus at Amani on *Manihot* sp. imported from Madagascar (*Ber. Deutsch-Ostafrika*, ii, p. 20, 1904). This accounts for the two names. *C. henningsii* and *S. manihotis*, being recorded from Tanganyika.

The origin of the records of *C. henningsii* and *C. manihotis* for the Philippines lies in an error by Baker in Elmer: *Leaflets of Philippine Botany*, vi, p. 2161, 1914. He there states that Sydow had recorded *C. henningsii* for the Philippines in *Philipp. Journ. Sci.*, C, viii, p. 507, 1913. But Sydow did not record a *Cercospora* on *Manihot* in this volume. He has consistently used the name *C. manihotis* P. Henn. [1907]; see his *Fungi Exot. Exsicc.* no. 295.

To sum up, authentic material of four of the five nominal species under discussion has been examined and the same fungus found in each; Zimmermann's picture of his *S. manihotis* also is decisive in showing that he had the same fungus; and no evidence has been forthcoming that determinations of fungi under any of the five names refer to anything but *C. henningsii* Allesch.

A summary of the diagnoses is appended :

DIAGNOSES GIVEN FOR THE DIFFERENT SPECIES.

|                                                            | Spore size.             | Septation.                 |
|------------------------------------------------------------|-------------------------|----------------------------|
| <i>C. henningsii</i> 1895                                  | 30 to 50 x 4 to 6 $\mu$ | 2 to 5                     |
| <i>C. cassavae</i> 1895                                    | 20 to 50 x 5 to 6 $\mu$ | 3 to 5                     |
| <i>C. manihotis</i> 1902                                   | 30 to 40 x 5 to 6 $\mu$ | 1 to 5                     |
| " " 1907                                                   | 25 to 37 x 4 to 5 $\mu$ | 1 then 3 to 5              |
| <i>S. manihotis</i> 1902                                   | 35 to 69 x 4 $\mu$      | 3 to 7                     |
| (ex Butler in <i>Fungi and Disease in Plants</i> , p. 310) | 20 to 90 x 4 to 8 $\mu$ | 0 to 9                     |
| Van Overeem 1925                                           | 18 to 50 x 4 to 6 $\mu$ | (usually 2 to 5)<br>3 to 7 |

***Cercospora hibisci*** Tracy & Earle in *Bull. Torrey Bot. Club.* xxii, p. 179. 1895.

On roselle (*Hibiscus sabdariffa*); Mandalay; D. Rhind; March, 1925. On *Hibiscus cannabinus*; Mandalay Farm; D. Rhind; 20/12/26.

No authentic material of this species is available for comparison. The specimens have been compared with Ceylon determinations of the species recorded in *Annals Roy. Bot. Gard. Peradeniya*, vii, p. 320, 1922. Material examined: on *H. sabdariffa*, Petch no. 4934, and on *H. esculentus*, Petch no. 5715, both in Herb. Kew. It may be noted that the earliest named species of *Cercospora* on *Hibiscus* is *C. brachypoda* Speg., of which no material is available here; it has the same coloured spores 'vix chlorinis fumosis', and from its diagnosis is not obviously dissimilar.

***C. latimaculans*** Wakef. in *Kew Bull. Misc. Inf.*, 1918, p. 210.

On *Bauhinia reticulata*; Aburi, Gold Coast; R. H. Bunting; 19/3/24.

***C. longipes*** Butler in *Mem. Dept. Agric. India*, Bot. Ser., i, 3, p. 44, 1906.

On leaf spot of cultivated sugar-cane; Kyagwe, Uganda; J. D. Snowden (no. 988); 15/6/26.

***C. melongenae*** Welles in *Phytopath.*, xii, p. 63, 1922.

On brinjal (*Solanum melongena*); Botanic Gardens, Seychelles; P. R. Dupont; 22/11/27.

*C. musarum* Ashby in *Bull. Dept. Agric. Jamaica*, N.S., ii, 6, pp. 110-111 and pl. 23, 1913.

On black spot of banana leaves; Jamaica; I. Maxwell; October, 1926. Isolation from banana fruit (*Musa cavendishii*) Bermuda; L. Ogilvie; comm. September, 1927.

The species is listed here as it was at first determined under this name. It has received, however, a previous name in literature. A specimen of the fungus was found in the folder of *Brachysporium torulosum* Syd. in Herb. Kew. This specimen had been received from the Gold Coast on a banana sucker in 1917: coll. R. H. Bunting. This determination had not been published, as the specimen differed from the diagnosis in one particular. The spores were stated in the diagnosis to be attached at their pointed base and to have a rounded obtuse apex.

They showed, however, a distinct scar of attachment on the rounded end, which is accordingly also the basal end.

Herr Sydow has very kindly forwarded to the Bureau a portion of his type specimen, labelled '*Brachysporium torulosum* Syd. Dead leaves of *Musa sapientum*. Brazil: Para. 24/1/1908. Leg. C. F. Baker no. 226'. As this specimen shows all the characters of the Gold Coast specimen from R. H. Bunting in Herb. Kew., the Jamaica collection from Miss I. Maxwell, and the isolation from Bermuda from L. Ogilvie, they must all be referred to the same species, for which the earliest name is *Brachysporium torulosum* Syd.

The fungus, however, hardly belongs to the genus *Brachysporium*, as originally founded by Saccardo on the species *Helminthosporium obovatum* Berk. and *H. coryneoideum* de Not. Judging by the figures only, the spores of both these species are broadest about their apical two-thirds, are obtuse at the apex, and taper to the base. In his diagnosis of *B. torulosum* Sydow describes the spores as 'late clavatis, apice rotundatis, basi attenuatis', and for this reason probably referred the species to *Brachysporium*. But as the spores are in fact attached by the broad end, this genus will hardly do.

Neither is the fungus a typical species of *Cercospora*, with its broad spores tapering to the apex and becoming rather deeply fuscous. It was referred to this genus, as its spores were considered to resemble in shape *Cercospora melonis* Cke, which is itself not a typical *Cercospora*; it has in fact been made the type species of the genus *Corynespora* Güssow. Mr. Ashby now considers that in shape of conidiophore and spore it is probably closely allied to, but not identical with, *Helminthosporium nodipes* Penz. & Sacc., as figured in *Icones Fung. Javan.*, pl. Lxx, f. 2, 1904. He proposes accordingly the new combination

***Helminthosporium torulosum* (Syd.) Ashby, comb. nov.**  
*Brachysporium torulosum* Sydow in *Hedwigia*, xlix, p. 83, 1909.  
*Cercospora musarum* Ashby, loc. cit.

The most striking character of the fungus is the conidiophore. This is highly chitinized and gradually increases in diameter from the base to the apex; at the apex it swells up to form a subglobose head of about 10  $\mu$  diameter, on the tip of which one spore is borne. In simple cases growth is continued from some point on the periphery of the enlarged head, but not always from the apical point, so that a structure is formed resembling the figure of the conidiophore of *H. nodipes*.

Frequently, however, growth is continued from the cell below the subglobose head; the first impression one gets is that this secondary growth is inside the conidiophore and grows right through the apical head, as Miyabe figures for *Macrosporium parasiticum* Thüm. in *Annals of Botany*, iii, pl. 1, fig. 3, 1889. At other times it appears to be outside the conidiophore but closely appressed to the apical head, as Ashby figured and described it.

**Cercospora neriella** Sacc. *Fungi Ital.*, t. 672, 1881; *Michelia*, ii, p. 294, 1881.

On oleander; nr. Moshi, Tanganyika; G. B. Wallace (no. 1118); 18/6/27.

**C. nicotianae** Ell. & Ev. in *Proc. Acad. Nat. Sci. Philadelph.*, 1893, p. 170.

On tobacco; Mauritius; E. F. Shepherd, comm. for Wembley, 1924; Zomba, Nyasaland; E. J. Butler; 16/2/27 and on curing tobacco; W. Gibson; Nyasaland; February, 1927.

Ellis and Everhart described their species with spores up to 6-septate and measuring  $40$  to  $75 \times 3$  to  $3.5 \mu$ . Raciborski, in *Parasit. Algen und Pilze Javas*, ii, p. 40, 1900, recorded *Cercospora nicotianae* for Java, but stated that under Java conditions the measurements of conidia and conidiophores were very different from those of Ellis and Everhart; the conidia were 3- to 5-septate and  $60$  to  $180 \times 4$  to  $4.5 \mu$ .

Saccardo and Sydow, in compiling the *Sylloge*, vol. xvi (pp. 1070, 1071), 1902, decided that Raciborski's record must refer to another fungus and listed it as *C. raciborskii* Sacc. & Syd. Since this time workers have often been somewhat puzzled as to which species to refer the fungus which causes the frog eye spot of tobacco leaves. The Dutch East Indian mycologists are now using the name *C. nicotianae*, thus presumably indicating that they do not differentiate the East Indian form from the American form. Pending further critical study, the name *Cercospora nicotianae* is accordingly adopted for the *Cercospora* on tobacco in Mauritius and Nyasaland.

**C. personata** (B. & C.) Ell. & Ev. in *Journ. of Mycol.*, i, p. 63, 1885.

*Septogloeum arachidis* Zimmerm. in *Bericht. Deutsch-Ostafrika*, ii, p. 19, 1904.

On groundnut; Uganda; W. Small, comm. for Wembley, 1924; Salisbury, S. Rhodesia; F. J. Eyles (no. 4987); 16/3/23 and (no. 5001); 8/3/26. Nr. Arusha, Tanganyika; G. B. Wallace (no. 1161); 18/6/27.

**C. sesami** Zimmerm. in *Bericht. Deutsch-Ostafrika*, ii, p. 29, 1904.

On cultivated sim-sim (*Sesamum indicum*); Bukalasa, Buganda; J. D. Snowden (no. 990); 5/7/26.

**C. sorghi** Ell. & Ev. in *Journ. of Mycol.*, iii, p. 15, 1887.

On Guinea corn (*Andropogon sorghum*); Adakrom Trum Road, Gold Coast; H. A. Dade (C. B. 268); 4 8 25. On *Sorghum barbuda* Serere, Teso; Uganda; J. D. Snowden (no. 1000 p.p.); 2/8/26.

#### CERCOSPORELLA SACCARDO

'*C. gossypii* Speg.' *Fungi Guaranitici Pug. I*, pt. 5, p. 162, 1886.<sup>1</sup>

**Ramularia areola** Atk. in *Bot. Gaz.*, xv, p. 166, 1890.

On cultivated cotton; Kampala, Uganda; J. D. Snowden (no. 971). On upland cotton; Exper. Stat. Morogoro, Tanganyika; A. H. Ritchie. On cotton leaves; Kilasa, Tanganyika; 15/9/27; G. B. Wallace (no. 1176).

Spegazzini's *Cercospora* *gossypii* was founded on Balansa's Pl. du Paraguay, no. 3856, on leaves of *Gossypium* sp., near Paraguay, May.

<sup>1</sup> This is cited from a separate of *Fungi Guaranitici Pug. I*, issued 1886, with its own pagination. The fungus was actually founded a year or two earlier in *Anal. Soc. Cient. Argentina*, Buenos Aires.

1883. One of Balansa's exsiccata, under this number and label, is in Herb. Kew., and is a typical specimen of 'areolate mildew'. Miss Wakefield's determination of *C. gossypii* in *Kew Bull.* 1920, p. 299, 'on cultivated cotton, Kipago, Uganda; Dummer 1835' is also this species. The fungus has been named *Cercospora gossypii* in Paraguay, Uganda, and the Congo, and *Ramularia areola* throughout nearly the whole tropical world. As Atkinson's well-known name is antedated by that of Spegazzini, it must give way to it. As, however, the writer has made no study of the type species or of the common usage of these two genera, the fungus is here retained under its best-known name, *Ramularia areola* Atk.

## CERCOSPORINA SPEGAZZINI

**C. ricinella** (Sacc. & Berl.) Speg. in *An. Mus. Nac. Buenos Aires*, xx, p. 429, 1910.

On *Ricinus communis*; Mwika, Tanganyika; G. B. Wallace (no. 952); 16/5/27.

## CHLAMYDOMYCES BAINIER

**C. palmarum** (Cke) comb. nov.

*Trichobasis palmarum* Cke in *Grevillea*, v, p. 102 and pl. 86, fig. 9, 1877.

*Uredo palmarum* (Cke) de Toni in Sacc., *Sylloge*, vii, p. 855, 1888.

*Mycogone rufa* Petch in *Annals Roy. Bot. Gard. Peradeniya*, vi, 3, p. 246, 1917.

On petioles of Chinese bananas: Teneriffe; Messrs. Elders & Fyffes; comm. July 1925. On corms of Javanese bananas (*Musa sapientum*); comm. Director, Royal Botanic Gardens, Kew; March 1928.

On leaves of *Phormium tenax*; St. Helena; The Governor of the Island; comm. October, 1927.

On decaying buds of *Cocos nucifera*; Sierra Leone; comm. E. H. Hargreaves, September, 1925.

Authentic material examined: '*Trichobasis palmarum* Demerara' in Herb. Kew. '4542 *Mycogone rufa* Petch, on plantain fruit, Peradeniya 16/3/1918 Type' in Herb. Kew.

The genus *Chlamydomyces* was founded by Bainier for one species, *C. diffusus*, a fungus resembling *Mycogone* in spore form, but growing saprophytically (i. e. not as a parasite on other fungi) and without a microconidial stage like the so-called '*Verticillium*' or '*Diplocladium*' stage of *Mycogone* proper (*Bull. Soc. Mycol. France*, xxiii, p. 240 and pl. 26, figs. 4-6, 1907). Hotson stated that *Chlamydomyces diffusus* Bainier is a synonym of *Mycogone ulmariae* Potnebia (*Ann. Mycol.*, v, p. 21 and pl. II, fig. 26, 1907), and that in culture it develops an *Aspergillus*-like microconidial stage. An isolation from material from Liberia held in culture in Professor Thaxter's laboratory for some years was referred to this species (see *Proc. Amer. Acad. Sci.*, xlviii, p. 293, 1912).

It is believed that the present species is identical with *C. diffusus*,<sup>1</sup>

<sup>1</sup> Monsieur Radais informs me that no material worked with by Bainier is now in existence at the École de Pharmacie, Paris; and Dr. Hotson that he now has none of the material with which he worked.

and in culture it does develop an *Aspergillus*-like conidial stage. The large red or yellow two-celled macrospores, with maximum dimensions of about  $40 \times 28 \mu$ , may be differentiated at sight from the spores of the genuine species of *Mycogone* by the small, broadly cuneate (not sub-globose), hyaline, smooth basal cell and by the fact that there is no constriction at the septum. The genus *Chlamydomyces* is here accepted for species with macrospores as here described and which form an *Aspergillus*-like microconidial stage in culture.

This species has apparently been met with by many mycologists who have studied the fungi which occur on diseased material of tropical plants. Cooke (loc. cit.) described his *Trichobasis palmaram* on coco-nut leaves from Demerara (British Guiana). Ashby in Jamaica noted a *Mycogone* on the surface of a leaf base of coco-nut in an advanced stage of rot; the conidia were '2-celled, upper orange-yellow, warted, lower hyaline, much smaller, pointed; conidia  $33$  to  $36 \mu$  long  $\times$   $24$  to  $26 \mu$  broad' (*Bull. Dept. Agric. Jamaica*, N.S., ii, 6, p. 154, 1913). Baccarini found a *Mycogone*-like fungus on dead Areca palm (*A. madagascariensis*) in the Botanical Gardens of Florence, Italy. The upper cell of the 2-celled chlamydospore was larger, with a thick verrucose wall,  $28 \mu$  broad and  $30 \mu$  long; the lower cell, ob-conic with a smooth wall,  $18 \mu$  broad and  $7 \mu$  long. He created a hypothetical perithecial stage, *Hypomyces conviva*, to which he referred the *Mycogone* as chlamydospores (*Nuovo Giorn. Bot. Ital.*, N.S., ix, 4, pp. 483-498, 1902). Ferraris refers Baccarini's fungus to *Mycogone cervina* Ditmar (see *Flora Italica-Hyphales*, p. 757). Petch (loc. cit.) in Ceylon described his *Mycogone rufa* on decaying fruit stalks of *Musa paradisica* and on decaying coco-nut stems.

From their description, the following species, of which material is not available here, should be classified as *Chlamydomyces* and not as *Mycogone*, since the descriptions do not allow of distinguishing them from the present species.

(1) *Mycogone meliolarum* Pat. on the mycelium of *Meliola cyperi* Pat. on *Cyperus* sp. Congo; *Bull. Soc. Mycol. Fr.*, viii, p. 55 and pl. vii, fig. 3, 1892.

(2) *Mycogone flava* Zimmerm. on decaying coffee fruit in Java; *Centralbl. für Bakt.*, Abt. 2, Bd. viii, p. 218, 1902.

(3) *Mycogone cervina* Ditm. var. *theobromae* Sacc. on decaying cacao fruit from the Philippines; *Nuovo Giorn. Bot. Ital.*, N.S., xxiii, p. 212, 1916.

(4) The so-called chlamydospore stage of *Melanospora ventii* Koorders which occurred frequently on the dead leaves of *Ficus elastica* in Java. Its connexion with the *Melanospora* was not proved by cultures. (See Koorders, *Botan. Untersuchungen*, pp. 172-173, 1907.)

(5) It would appear probable that some (at any rate) of the spores of *Polythrincium* sp., described and figured by Aversa-Sacca on the berries of coffee attacked by the coffee borer in S. Paulo, S. America, belong to the present species. (See *Comm. Estud. e Debellação da Praga Caffeira*—São Paulo Publ. N. 15, pp. 51-53 and fig. 25, 1926.)

It is believed that all the records of species of *Mycogone* on flowering plants should be referred to species of *Chlamydomyces* and not to *Mycogone*. There is a British collection of what is apparently *C. palmarum*, developed on elm leaves in a damp chamber, in the *Mycogone cervina* folder in Herb. Kew. The record of this collection was apparently never published.

## CLADOSPORIUM LINK

**C. herbarum** (Pers.) Link *Observ. Mycol.*, ii, p. 37, 1816. [Records have not been kept of this extremely common organism unless it has been the subject of inquiry.]

On dew-retted flax straw: Director of Agriculture, Cyprus; comm. December, 1926.

In this habitat *C. herbarum* is apt to become very conspicuous. As Brooks and Hansford found that *C. herbarum* was the cause of 'black spot' of frozen meat and of seaweed (see *Trans. Brit. Mycol. Soc.*, viii, pp. 113 et seq., 1923), so it can cause black spots on cloth. Mr. Searle, Botanist to the Linen Industry Research Association, Antrim, writes: 'The only way in which it is detrimental is that it is liable to re-develop on yarns kept under too low humid conditions, and then, under certain circumstances, it causes black stains, which depreciate the value of the cloth.'

On loubia (*Dolichos lablab*) and cotton; the Gezirah, Sudan; R. E. Massey; comm. January, 1928.

As Tengwall recorded that *C. herbarum* was one of the commonest fungi isolated from sooty mould ('Russtaupilze') on a number of plants in Holland (see *Médec. Phytopath. Lab. 'Willie Commelin Scholten'*, vi, p. 36, 1924), so it may be a conspicuous element in sooty mould on loubia and cotton in the Sudan. Mr. Massey states that the fungus first developed in 'white fly' excretions, but it could also apparently grow directly on plants attacked by *Rhizoctonia solani*. It spread rapidly on cotton during the rains and caused some apprehension in the district, where local opinion is very sensitive of any blackening of the cotton plant. The first cutting of loubia was almost defoliated and definitely injured before the approach of the hot weather. With the arrival of the hot weather, however, both crops grew quite free from sooty mould. *C. herbarum* was also the obvious fungus composing sooty mould on cotton leaves from Kilosa, Tanganyika (G. B. Wallace no. 1198; 15/9/27) and on a cotton boll from Iraq (comm. R. Thomas; March, 1926).

Isolation from peppers (*Capsicum annum*); The Azores; Mlle M. Bensaude; comm. January, 1926.

The fungus formed olivaceous patches on the under surface of the leaves during September, October, and November. Mademoiselle Ben saude thought the disease worth recording. (See *Kew Bulletin*, 1926, p. 384.)

## CLASTEROSPORIUM SCHWEINITZ

'*Clasterosporium*' *maydicum* Sacc., in *Nuovo Giorn. Bot. Ital.*, N. S., xxiii, pp. 213, 214, 1916.

On leaves of maize; Kumasi, Gold Coast Colony; T. Hunter (C. B. 220); 12/5/25. Aburi, Gold Coast Colony; R. H. Bunting (C. B. 226); 20/5/25.

Isolation from inflorescence stalk of *Sorghum* sp.; Kambia, Northern Province, Sierra Leone; F. C. Deighton (M. 176); 28/12/27.

The material on maize leaves matched exactly Baker's 'Fungi Malayana' no. 217 in *Herb. Kew.*, issued as *Clasterosporium maydicum* Sacc. It differs from Saccardo's diagnosis in the following particulars:

- (1) the mature spores measure  $18 \times 10 \mu$  ( $14$  to  $15 \times 6 \mu$  in diagnosis);
- (2) they have 3 cross-septa (2 septa in diagnosis);
- (3) the spores have longitudinal septa at maturity.

Unfortunately isolations were not secured from the fungus on maize; an isolation secured from *Sorghum* sp. from Sierra Leone, however, appears to me to belong to the same species as the fungus on maize; but well over 90 per cent. of the spores of the *Sorghum* isolation have only 2 cross-septa (as in Saccardo's diagnosis of *C. maydicum*). Although none of the few spores observed on the host plant (*Sorghum*) had longitudinal septa, nearly all spores in culture finally developed them. The two fungi are here provisionally referred to the same specific name.

The occurrence of longitudinal septa removes *C. maydicum* from the genus *Clasterosporium*, and so an attempt was made to classify it correctly. The fungus appears on the maize leaves in little patches less than 1 mm. in diameter. The spores are borne singly at the tip of short branches of the ordinary mycelium. Each spore is not abstricted from its spore-bearing hypha, but is cut off by a cross-septum laid down right across the hypha. In all these characters the species appears to me to be congeneric with *Stigmella dryophylla* (Corda) Lindau [= *S. dryina* Lév.], which is the type species of the genus *Stigmella* Lév. This conclusion was based on Saccardo's figure of *S. dryophylla* and also on an independent figure by Ferraris. Bubák, however, studied exsiccata of the genus *Stigmella* in 1914 (see *Ann. Mycol.*, xii, p. 218), and stated that *S. dryophylla* is not a hyphomycete at all, but a pycnidial fungus close to *Camarosporium*. He erected two new genera on other species of *Stigmella*, a Melanconiaceous genus *Stigmopsis*, and *Piricauda*, belonging to the Dematiaceae.

'*Clasterosporium*' *maydicum* is accordingly here listed under its original generic name. It is figured by Bunting in *Bull. Dept. Agric. Gold Coast*, x, pl. x.

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